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MARCH 1944

# **THE BULLETIN**

OF THE

## **U. S. Army Medical Department**

A periodical containing original articles, reviews, news, and  
abstracts of interest to the Medical Department of the Army

ISSUED UNDER THE AUSPICES OF  
THE OFFICE OF THE SURGEON GENERAL

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**PUBLISHED MONTHLY AT THE MEDICAL FIELD SERVICE SCHOOL,  
CARLISLE BARRACKS, PENNSYLVANIA**

By direction of the Secretary of War, the material contained herein is published as administrative information and is required for the proper transaction of the public business.

NORMAN T. KIRK  
Major General, U. S. Army,  
The Surgeon General.

**NUMBER 74**

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**WAR DEPARTMENT**  
**OFFICE OF THE SURGEON GENERAL,**  
**WASHINGTON 25, D. C.**

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### **U. S. Army Medical Department**

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## Foreword

With the October 1943 issue, The Bulletin became a monthly periodical, instead of a quarterly, dedicated to keeping the personnel of the Medical Department informed on developments in war medicine. The new publication, known as The Bulletin of the U. S. Army Medical Department, absorbed the former quarterly dental and veterinary bulletins and will have material devoted to those fields in each issue.

The Bulletin is intended to be educational rather than directive in nature. It will contain the best information obtainable concerning military medical experience, observations, and procedure that may help to improve further the quality of professional services. The Bulletin will be a medium whereby experience gained in one theater of combat may be shared with those serving in other combat areas and with those in this country who are preparing for overseas duty. News items concerning military and scientific developments as well as original articles will be emphasized. The Bulletin, however, should not serve as a basis for the forwarding of requisitions for equipment or supplies referred to therein.

Obviously, some of the most interesting field experiences cannot be divulged in a periodical of this kind when our country is at war. The Bulletin will, however, publish that which can be safely told, drawing not only on current literature, but on many authoritative reports which reach The Surgeon General's Office from the field. Officers are invited to submit for publication reports of their field experiences that can profitably be shared with other officers.

The Medical Department has been commended for its work in caring for the sick and wounded in theaters of operations in war. The Bulletin will endeavor to stimulate such progress and to advance further the high standard of medical service in the Army of the United States.

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## Notice to Contributors

Contributions to The Bulletin should be typewritten, double spaced, with wide margins, and in duplicate including the original and one carbon copy. Great accuracy and completeness should be used in all references to literature, including the name of the author, title of article, name of periodical, with volume, page, and number—day of month if weekly—and year. Materials supplied for illustrations, if not original, should be accompanied by reference to the source and a statement as to whether or not reproduction has been authorized. Adequate legends should accompany each illustration in order to point out clearly to the reader the condition or lesion or other objectives, which in some instances should be indicated by a small arrow or other device. Each illustration and table should bear the author's name on the back; photographs should be clear and distinct; drawings should be made in black ink on white paper. Original articles will be accepted for publication on condition that they are contributed solely to The Bulletin and that editorial privilege is granted in preparing the material submitted for publication. Reprints may be ordered for official use only.

# News and Comment

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## THE PREVENTION OF HEAT STROKE

A healthy man in hard training with ample supplies of water and salt can withstand high atmospheric temperatures; but danger arises when gastro-intestinal upsets cause dehydration and salt-loss through vomiting and diarrhea, or when toxemias or infections such as malaria or sandfly fever disturb the heat-regulating mechanism. Fatigue, overwork, and lack of sleep and food predispose to heat-stroke, especially in those unaccustomed to a hot climate; and where no special precautions are taken, cases are commonly seen during or soon after disembarkation, in troops who have unloaded stores after a poor night's rest and have then, perhaps, set out to march to a rest-camp. In "Selections from the Army Medical Department Bulletin 1941-42," issued by the War Office, London, S. W. 1, in April 1943, it is said that in Egypt and the Western Desert casualties from the heat have been remarkably few; however, in parts of India, Iraq, Persia, and at Red Sea ports, where temperatures are much higher, the risk has been serious both for active troops and for the sick.

General precautionary measures include, ideally, accommodation in cool quarters and avoidance of over-exertion, especially in the hotter part of the day. Clothing should be light to facilitate loss of heat by evaporation, and plenty of water should be supplied to replace that lost in sweating. The men should be encouraged to drink more than they want to quench their thirst, for even when supplies are plentiful they tend to drink less than is required to replace the fluid they have lost.

The effects of dehydration induced by excessive sweating cannot, however, be relieved by water alone; and when dehydration threatens, it is essential to replace the salt as well as the water lost from the body. The amount of sodium chloride likely to be ingested from the rations will on an average cover a water intake up to two gallons a day; but if there is any chance of men drinking that much, they should take extra salt. Probably it is best that salt be taken with meals—especially the evening meal. But where there is any doubt about its consumption with food, it can be added to the

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The Surgeon General's Office issued on 28 July 1943 Circular Letter No. 136, on the treatment of heat stroke, heat exhaustion, and heat cramps, in which additional information will be found.

drinking water. An addition of 5 grams per gallon gives a solution of roughly 0.1 percent, which is not at all unpleasant to drink; indeed, many prefer it to plain water in hot weather.

Particular attention must be paid to all these requirements during long spells of heat, and personnel should have suitable instruction in preventive measures; but they should also be made to understand that with ordinary care the danger of ill effects from heat is not great. They should at the same time be warned against alcohol, which must not be taken before sundown. During hot weather hospital wards should be kept as cool as possible, and in places where a dry wind is always blowing, wet brushwood screens have proved even more effective than fans. Especially in tented wards, all febrile patients must be looked at frequently; for they are liable to develop hyperpyrexia suddenly and will die without prompt treatment. Recurrence is also more than a possibility, and anyone who has had hyperpyrexia or serious heat exhaustion needs at least three weeks' careful treatment before he is allowed to go about or can safely be sent on a long journey.

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#### MOTION SICKNESS PREVENTIVE

Motion sickness preventive has recently been added to the Medical Department Supply Catalog as a standard item under the following nomenclature: Item 12960, Motion Sickness Preventive, U. S. Army, 6 capsules in box. This item has been under test for several months in continental United States and also has undergone limited testing in actual field operations. Experience indicates that it may produce at least a 50 percent reduction in the incidence of motion sickness. When used in accordance with directions, it has no significant untoward effects, but, since it contains a sedative, excessive use may cause drowsiness with resulting decrease of physical efficiency. The item may find a useful place both in amphibious operations and in transportation of personnel by sea. It is possible, though not conclusively confirmed, that it may be useful in the prevention of air sickness. This item is being purchased packaged in individual boxes of six capsules; each capsule is wrapped in a strip of moisture-proof metal paper which will permit use, one at a time, keeping the unused capsules perfectly dry. Directions for use to prevent motion sickness will be printed clearly on each box. This item probably will be available for general distribution this spring.



**QUADRICEPS DEFICIENCY**

After inactivity and immobilization of a knee joint from any cause, and especially after injury and operations for internal derangement of the knee, a rapid atrophy and weakness of the quadriceps femoris muscle of the thigh develop. This weakness of the muscle which is commonly referred to as "quadriceps deficiency," results in a lack of ability to forcefully extend the leg, inability to walk up and down stairs, and in a tendency to flexion deformity. A pronounced loss of strength and a definite decrease in size of the muscle can be demonstrated as early as forty-eight hours after injury or operation. Unless the condition is kept in mind and preventive measures are adopted, a great loss of man days will result. The importance of "quadriceps deficiency" and the simple means of preventing and curing it justify the emphasis and consideration of this condition by all medical officers. That its importance has not been sufficiently realized is shown by the fact that only one-third of Army hospitals recently surveyed had instituted an adequate program for correction and prevention of "quadriceps deficiency."

To prevent and to correct "quadriceps deficiency" appropriate exercises must be instituted as early as possible after the knee has been immobilized and this can usually be done within twenty-four to forty-eight hours. The exercises consist of slow rhythmic contractions of the quadriceps muscle with the knee fully extended and with the patient recumbent. The proper exercises cannot be done if the knee is flexed. In order to produce satisfactory contractions of the muscle, the patient is instructed to "Press the knee down" or "Pull the kneecap up." Both extremities should be exercised at the same time. Palpation of the thigh should be done by the attendant to determine whether the muscle is being properly contracted. This type of exercise should be increased as rapidly as can be tolerated until one hundred contractions can be performed at hourly intervals. As strength improves, straight leg raising, active knee motion, and resistive exercises are added. The best results have been obtained when patients have been grouped to receive instruction by special personnel. When an operation on a knee is anticipated, it is advisable to train the patient in quadriceps exercises before the operation is performed.

Active walking alone or strenuous outdoor exercises do not tend to restore the strength of the muscle; in fact, it is important that the muscles be restored before unlimited weight bearing is allowed.

## DENTAL SERVICE IN THE FIELD

The first-aid station in the combat zone generally has a dental officer with a dental assistant and the M. D. Chest No. 60. Sufficient supplies and equipment are available to do an appreciable amount of definitive dentistry, with the exception of dentures, when the time and conditions permit. Frequently tents or other direct shelter is not available or desirable depending to a large extent on battle conditions and location.



Photograph by U. S. Army Signal Corps.

When the unit moves into actual combat, the dental officer and his assistant carry their respective dental kits which permit emergency and first-aid care. The M. D. Chest No. 60 is then stored or left at a designated point to be reclaimed by the dental officer when the unit returns from the combat area.

### DELAYED MORPHINE POISONING

In recent reports from certain theaters of operations, attention has been directed to occasional cases of morphine poisoning or of dangerous respiratory depression and coma from the sudden absorption of large doses of morphine. This apparently has developed most frequently in wounded patients in shock or with a low blood pressure from other reasons who have been chilled from exposure, and to whom the one-half grain dose of morphine in the syrette has been administered subcutaneously on the battlefield.

Because of the markedly depressed circulatory state, the morphine is not absorbed and no clinical response is observed; consequently, a second dose of morphine frequently is given within a short time. Subsequently, when the patient recovers from shock or, having been taken to a hospital, becomes warm and more normal circulation is established, an excessive amount of morphine is suddenly absorbed, producing the clinical manifestations of overdosage or morphine poisoning and calling for immediate treatment. Prompt diagnosis and treatment are very important. A tourniquet should be placed proximal to the site of injection of the morphine to slow up its absorption. The tourniquet of course should be released from time to time.

The development of this serious and sometimes fatal condition can be avoided by administering the morphine to this type of patient intravenously rather than subcutaneously. The intravenous dose should be given slowly and should rarely exceed one-eighth grain (eight milligrams).

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### SHRINKAGE OF DENTAL ENGINE BELTS

The following information has been received from Lieutenant Colonel Clare T. Budge, D. C.:

There has been a tremendous shrinking of dental engine belts (cords) due to heavy fog and high relative humidity. When this occurs, the belt may be restored to usefulness by immersion in water for a few seconds, then tying to it a weight of approximately two pounds and suspending it from a rafter. The distance from the bottom of the cord to the floor will be the amount the belt will be stretched. All dental cords should be placed in well-sealed cans until ready for use.

### **TREATMENT OF SULFONAMIDE-RESISTANT GONORRHEA WITH PENICILLIN**

Early in January of this year penicillin became available in sufficient quantity to completely replace fever therapy in the treatment of sulfonamide-resistant gonorrhea. Extensive clinical trials conducted in several Army hospitals during the summer and fall of 1943 had proved penicillin treatment to be almost entirely nontoxic, simple to administer, and, when an adequate amount of the drug was given, curative in 96 percent of cases. Re-treatment of failures raised the percentage of cures to nearly 99 percent.

The simplicity and ease of penicillin treatment of sulfonamide-resistant gonorrhea has removed the necessity for transfer of these patients to general hospitals, and it is probable that in the near future penicillin will be made a standard item requisitionable by all station hospitals. Measures intended to decentralize the treatment of resistant gonorrhea have already been effected by means of automatic shipments of penicillin to all station hospitals on posts over 10,000 in strength and by authorizing general hospitals to ship penicillin to station surgeons so that treatment may be carried out at the home station.

The treatment now recommended consists of 20,000 units of penicillin intramuscularly every three hours for five injections for a total dosage of 100,000 units per case. Failures to this schedule are re-treated, using the same dosage. Any cases not responding to three courses of penicillin are considered resistant and are then treated by other methods. Patients with complications of gonorrhea may require a prolongation of treatment with increased total dosage.

The response to treatment is usually prompt. Ordinarily, cultures and smears become negative within 24 hours following the institution of penicillin treatment, and the urethral discharge disappears within three to four days. However, in certain individuals the discharge may become mucoid and persist for a week or two. Individuals in whom a favorable response is not evident by the fifth day, as determined by change in character or disappearance of the discharge and the absence of gonococci on smear or culture, should be re-treated.

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Prepared in Venereal Disease Control Division, Preventive Medicine Service, Office of The Surgeon General.

Relapses are so infrequent following penicillin treatment that it is considered unnecessary to prolong hospitalization or institute detailed criteria of cure. Cases should be discharged to duty as soon as they are asymptomatic, usually two or three days following treatment. The presence of a slight mucoid discharge is not considered of sufficient importance to prolong hospitalization, provided the gonococcus cannot be demonstrated by smear or culture. Following discharge from the hospital the patient should be inspected for evidence of relapse at weekly intervals for three weeks.

Reactions to treatment are infrequent. Some patients develop minor discomfort at the site of the injection. One or two degrees of fever occasionally develop but are not considered of sufficient importance to warrant discontinuance of treatment. Posttreatment urticaria has occasionally been noted.

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#### PREVENTING HOSPITAL EQUIPMENT FAILURE

In the combat zones, it is important to get every hour of efficient military use built by the manufacturer into every piece of hospital equipment that must be shipped in convoy from the zone of the interior. Especially is this true in the Pacific where small portable surgical hospitals are sometimes marched many miles through jungle and over mountains from the beach head. Failures of equipment due to enemy action or the tactical situation may be unavoidable, but many other failures can be avoided. Experience in this war has proved that a few minutes each day taken for preventive maintenance greatly reduces unnecessary equipment failure, especially on equipment with fast moving parts, motors, generators, batteries, burners, and heating elements.

Because of the shortage of technical personnel and the conditions under which many small surgical hospitals must operate, preventive maintenance will probably be limited to making sure that the equipment is thoroughly and properly lubricated, thoroughly cleaned, that all screws and nuts are tight, that there are no broken wires, that all valves are correctly adjusted, that there are no worn parts, and that inspection is made before each day's operation of every piece of equipment subject to failure by operation. Preventive maintenance pays. Most of all, it pays at the very places where there seems to be no time for it.



**OBSERVATION POST IDENTIFIES INFLUENZA VIRUS**

Under the direction of the Influenza Commission of the Board for the Investigation and Control of Influenza and Other Epidemic Diseases in the United States Army, Preventive Medicine Service, Office of The Surgeon General, observation posts have been set up in various parts of the country for the early detection of influenza in Army personnel. The following recent report\* serves to prove the presence of influenza virus type A in a Middle Western post before the disease was known to be present in other parts of the country.

On 28 May 1943 workers in one of the observation posts saw several patients ill with influenza at a station hospital, and, in doing a routine survey, isolated a strain of influenza virus type A (Weiss) from throat washings of one patient and obtained serologic evidence of type A infection in two other patients. No epidemic prevalence of influenza or other respiratory disease was noted at that time.

About four months later, several cases resembling mild influenza appeared at sick call at an Army Specialized Training Unit some forty miles from the station hospital where the other patients had been seen on 28 May. Throat washings from four of the later group were inoculated into ferrets and mice and carried forward through several passages in other ferrets and mice. Influenza A virus was identified in eggs inoculated with material from the second ferret passage of throat washings of one patient, and was established in mice inoculated with material from the second ferret passage of throat washings from another patient. Mice of the third passage of those inoculated with the original throat washings from one patient developed pulmonary lesions due to influenza A virus. Furthermore, mice inoculated with throat washings of these two patients were found to be immune to Weiss and PR8 strains of influenza A virus, when tested fourteen days later, but they were not immune to the Lee strain of influenza type B. Similar studies on two other specimens from patients with clinically similar conditions did not yield evidence of the presence of influenza A or B. Thus the presence of influenza type A was detected at the onset of an epidemic before the disease was known to be present in other parts of the country.

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\*Salk, Jonas E., Menke, Wilbur J., and Francis, Thomas, Jr.: Identification of Influenza Virus Type A in Current Outbreak of Respiratory Disease, J. A. M. A., 124:93, 8 Jan. 1944.



During the outbreak of acute respiratory diseases beginning about the middle of November and passing the peak about the end of December, members of the Commission on Influenza identified influenza type A virus at posts and stations in Michigan, New York, Missouri, Iowa, Minnesota, North Carolina, Tennessee, California, and Oregon. Reports reaching The Surgeon General's Office indicate the type A virus was also the predominating type in the recent outbreak of influenza in England.

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#### THE ARMY NEEDS PHYSICAL THERAPY AIDES

To meet the urgent need for qualified physical therapy aides, women may now be recruited for the Women's Army Corps in order to attend one of the six months' courses in physical therapy offered by the Medical Department of the Army.

To be eligible for this training, an applicant must be a citizen of the United States, must not have passed her 44th birthday on the opening date of the course, must have no dependent children under 14 years of age, must meet the physical requirements as prescribed in Army Regulations, must have completed four years of college with emphasis on physical education or two years of college, including satisfactory courses in biology and other sciences, and must have completed her basic training in the Women's Army Corps.

Those who successfully complete this course in physical therapy will be assigned to selected Army hospitals for three months of practical experience in the actual treatment of patients. On the satisfactory completion of three months of experience in an Army hospital, these enlisted women will be eligible to request release from the Women's Army Corps in order to apply for appointment as Medical Department Physical Therapy Aide with the relative rank of second lieutenant. These officers will be assigned to Army hospitals wherever needed in this country or overseas.

All applications for enlistment in the Women's Army Corps to attend one of these courses will be forwarded to the Office of The Surgeon General, Washington 25, D. C., for review and approval prior to final enlistment.

Application blanks and additional information may be obtained from the nearest recruiting office of the Women's Army Corps or from the Office of The Surgeon General, Washington 25, D. C., Attention: Physical Therapy Section.

**MEDICAL POUCH FOR PARACHUTISTS**

The Medical Pouch, Parachutist, is one of the Medical Department's most recently standardized items; its development was originated by the Airborne Command to satisfy requirements for a pouch in which the personnel of the medical detachments of airborne units could carry essential surgical instruments and medical supplies with them in descent in order to have them immediately available.

The pouch, made of duck, consists of a large double center compartment with a half-size compartment attached at each side. The smaller compartments fold a-



gainst each side of the large compartment and are secured in place by tapes tied in front. A continuation of the back is shaped to close the top and overlap both ends and front. The shoulder straps are adjustable so that the pouch may be carried securely under the reserve parachute in descent, open or closed on the chest for ground use, and on the back for ground carry.

The contents are available and are selected from Chest, M.D., No. 1, and Chest, M.D., No. 2, which are organization allowances for airborne medical companies. Typical lists of contents have been prepared, indicating that all of the essential surgical instruments, medications, dressings, and other medical supplies can be carried in eight pouches. The basis of issue is one for each officer and enlisted man, parachutist, medical detachment, airborne unit.

**VETERINARY INSECTICIDES AND REPELLENTS**

Thanite, a new insecticide, and indalone, an insect repellent, were made available last summer to the various services having horses, mules, and dogs. These preparations were substituted for formerly used products containing pyrethrum as the principal ingredient. Complete reports on the use of these agents are not yet available, as the season when biting insects are most prevalent had passed before the chemicals had been used on an appreciable scale. However, reports received from units that had an opportunity to use the preparations indicate that the results obtained were satisfactory. Thanite is supplied in a 5 percent solution contained in a fairly heavy mineral oil such as Sonneborn's No. 50, white, or Bayol D. It is effective against horse lice, stable flies, and horn flies, when applied over the body surfaces of horses, mules, and dogs, in the form of a light, fine spray, using a hand-type sprayer. Precautions must be taken not to apply this mixture in excessive amounts. It is important that care be taken in spraying, to avoid the eyes and that the spray be used very sparingly in sensitive areas, such as the perineal region. Never apply thanite preparations with a sponge or cloth. These precautions are of particular importance in the use of this agent on horses.

Indalone is applied over the body surfaces of animals, full strength. While this product does not have the killing qualities of thanite, it is reported that an application of the preparation is effective in repelling insects for a period of from four to six hours.

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**BREAKAGE OF LEADED GLASS**

As a result of reports of overseas breakage on leaded glass covering the fluoroscopic screen of Item 96145, X-ray Field Unit, Table Unit, the Army Medical Purchasing Office instigated investigation by the Pittsburgh Plate Glass Company of means of reducing this breakage. The Pittsburgh Plate Glass Company reports that success has been obtained in applying heat-treating to leaded glass and that they can now supply "Herculited Leaded Glass," which will have three to four times the resistance to breakage that ordinary leaded glass has. Steps have been taken to accomplish the necessary change in Medical Department Specifications for Item 96145 in order that future procurement of this item will incorporate this new development.

### MAXILLOFACIAL INJURIES AND JAW FRACTURES

Reports regarding the incidence of maxillofacial injuries and jaw fractures have been received from two general hospitals where patients from overseas arrive directly via hospital ship or airplane. Although limited, these data indicate some of the problems and trends in the management of these cases.

One hospital reported that of the 1,853 battle casualties received, 90 patients or 4.94 percent had one or more jaw fractures listed as follows: mandibular, 64; maxillary, 15; mandibular and maxillary, 11.

Of the patients with fractured jaw, 9 had developed an osteomyelitis; 10, suppuration; and 2, a cellulitis. The report indicated that 95 percent of the maxillofacial injuries had one or more jaw fractures. Of the 90 fractures, 53 were the result of shrapnel and gunshot, while 18 were caused by motor vehicle accidents.

The other hospital receiving patients from another theater stated that 11 percent of the total wounded received had been maxillofacial cases. The percentage of jaw fractures in maxillofacial patients in this hospital was about 86 percent.

The physical condition of the patients and the initial treatment of the fractured jaws in the overseas areas have been consistently good. The general type of fixation employed has been that of wiring and the use of interdental rubber ligatures, the latter having been found more satisfactory particularly during transportation.

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### THE TONGUE AS AN INDEX OF HYDRATION

Lieut. Giddings, M.C., A.U.S., recently wrote from a base hospital in Sicily in part as follows: "The question as to how much fluid is necessary to cover the plasma a patient receives is decided by the state of a patient's tongue and little else. It seems a perfectly adequate criterion." This observation states clearly the common experience of good clinicians as to the value of the fluid condition of the saliva and the surface of the tongue in indicating the degree of hydration of the body as a whole. With the rapid changes in hydration encountered in shock and hemorrhage or when administering plasma or albumin, the tongue may be our only quick index of fluid needs. (*BuMed News Letter* of 26 November 1943)



**ARMY MEDICAL PURCHASING OFFICE**

The Army Medical Purchasing Office in New York City is the division of The Surgeon General's Office responsible for the procurement by purchase of medical and dental supplies and equipment for the Army, International Aid, and other designated agencies. This office is responsible for the placement of contracts and for the complete cycle of procurement from the receipt of requirements from the Distribution and Requirements Division to final acceptance of supplies by the receiving depot. The Inspection Branch has 75 civilian and 11 officer inspectors, 11 administrative officers, and covers about



A United States Army medical supply depot somewhere in New Caledonia.

800 manufacturing plants in 200 localities in 29 states. The inspection performed by this office is a production line inspection which does not preclude final inspection at destination. Using November 1943 as a representative month, the cost of inspection was 0.104 percent of the cost of supplies shipped.

A laboratory is maintained for research, testing, examination of samples, and for operating a school for inspectors. Changes of materials, construction, design, and packaging are continuously under study.

**OUTBREAK OF RESPIRATORY INFECTIONS**

The recent outbreak of upper respiratory infections was preceded by a period of exceptionally low morbidity from these causes; in fact, October 1943 set a record low for the Army in continental United States, with morbidity from colds and influenza continuing low for the country as a whole during the early part of November.

An outbreak of common respiratory infections was reported first in the North Central States during the second week of November. During the third week of November, marked increases in morbidity from colds and influenza were reported from states adjoining to the east and from the Middle Atlantic States; in the last week of November the outbreak spread to New England and southward to Washington, D. C. Not until early December did the morbidity from common respiratory diseases and influenza begin to rise sharply in the South and West.

The peak of the outbreak was passed in the Midwest in the first week of December; peak admission rates the following week were experienced in the Middle Atlantic States, New England, and Washington, D. C. In the South and West peak rates were not reached until the third and fourth weeks of December.

The highest admission rates from common respiratory diseases and influenza (about 25 per thousand per week) were registered in Washington, D. C., the Midwest, and in New York State. The lowest rates were recorded in the South. For the country as a whole, the peak rate of about 12½ per thousand per week was reached during the second week of December.

The rate of admission from common respiratory infections for the entire Army in the United States was only about 8 percent higher in December 1943 than in December 1942. Morbidity from these causes in December 1943 was actually slightly below that recorded for January 1943. Only on the Atlantic seaboard did the recent outbreak show considerably higher admission rates for the month of December 1943 than were experienced in either December 1942 or January 1943. Compared with the peak of the influenza epidemic in January 1941, the recent outbreak of upper respiratory infections registered admission rates less than half of those reported in January 1941.



The difficulty of clinically differentiating influenza from common respiratory disease was again demonstrated in this epidemic. Only a small proportion of the cases were diagnosed as influenza, the highest proportion reported as influenza from any service command being about 25 percent of the common respiratory diseases.

This epidemic was typical of influenza in its sudden appearance, sharp increase to a peak in from three to four weeks, rapid spread attacking about 10 percent of the population, its low mortality, and prompt subsidence in from six to eight weeks after onset. In the average patient there was a rather sudden onset with chills or chilliness, pharyngeal irritation, generalized aching with mild to moderate prostration. Pulmonary symptoms were not prominent. The temperature reached 100° to 103° F., and leukopenia or absence of leukocytosis was the rule. The febrile course lasted from three to five days followed by relatively prompt recovery except for residual fatigue.

Influenza virus A was recovered from nose and throat washings from patients in ten widely scattered areas of the country and a majority of the patients studied during the height of the epidemic showed a rise in serum antibodies against influenza virus A in the course of their illness.

The mildness of the recent outbreak is indicated by the lack of complications, by the fact that admission rates from pneumonia for December 1943 were about 25 percent under those for December 1942, and by the relatively short duration of noneffectiveness.

The recent outbreak of influenza, it appears, was not unusually serious either in point of the number of Army personnel affected or of the severity of the sickness. The mildness of this epidemic should not give rise to a false sense of security, however, since influenza epidemics with high mortality are frequently preceded by waves of mild influenza. It is entirely possible that this sequence may again occur.

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#### DENTAL STONE RECONDITIONED

Dental supplies with few exceptions maintain their state of usefulness in tropical humid climates. One brand of stone, which is packed in paper containers, loses some of its properties by the absorption of moisture. The properties of this stone may be restored by heating until the moisture is removed.

### APPROVAL OF MILITARY HOSPITALS

In the December 1943 issue of *The Bulletin of the U. S. Army Medical Department*, page 11, it was stated that, for reasons specified, it had been agreed by the American College of Surgeons and the Office of The Surgeon General that approval of military hospitals by the American College of Surgeons is no longer considered desirable and will be discontinued for the duration of the war. This has apparently caused some confusion with the annual census of hospitals taken by the Council on Medical Education and Hospitals of the American Medical Association. Whereas the questionnaires employed by the two agencies are similar, each organization has its own distinctive separate requirements, inspections, and approved lists. Moreover, a distinction should be made between approval of hospitals and registration. The former signifies "specific endorsement of hospitals for educational purposes"; whereas the latter means a "basic recognition extended to the hospitals and related institutions concerning which the Council has no evidence of irregular or unsafe practices." Although the procedure of approval of military hospitals is not considered desirable at the present time, The Surgeon General approves the procedure of registration of U. S. Army hospitals by the Council on Medical Education and Hospitals of the American Medical Association with the provision that the data supplied will be held strictly confidential and will not be released without approval by The Surgeon General or higher authority.

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### SCHOOL OF MALARIOLOGY IN NORTH AFRICA

An Allied Force Malaria Control School has been established in Algiers under the direction of Colonel Paul F. Russell, M. C. The purpose of this school is to give instruction during the nonmalaria months in certain phases of military malariology to selected personnel, medical and nonmedical. The school is organized in three sections: American, British, and French. Malaria specialists now in the theater will be utilized as instructors. With instruction based on the lessons from experience in the North African theater during 1943, the school will make preparation for more effective malaria control in 1944.

### VACCINATION OF ARMY ANIMALS AGAINST EQUINE ENCEPHALOMYELITIS

Arrangements have been completed for the annual vaccination of all horses and mules of the Army against equine encephalomyelitis with the bivalent type of vaccine, made at the Army Veterinary School, Army Medical Center, Washington, D. C. Shipments of the vaccine will be begun in March in order that the immunization of all animals may be completed prior to the advent of the mosquito season.

Since inception of the vaccination procedure in 1939 the treatment has been repeated annually with exceptionally satisfactory results. During this period only one proved case of the disease has occurred among Army animals and this was before all Army animals were immunized with a bivalent vaccine against both types of virus present in the United States. This animal had been immunized against the "western" type virus and subsequently became infected with the "eastern" type.

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### RECORD LOW VENEREAL DISEASE RATE

Preliminary figures indicate that the Army venereal disease rate reached an all-time low of 27 per 1,000 per annum for 1943. The rate was 38 in 1942, 40.5 in 1941, and 42.5 in 1940. The 1943 rate is not strictly comparable to the rates of previous years, however, since the cases that existed prior to service were not counted in computing the rate since October 1942. This change was considered necessary at that time, because the program of inducting individuals with venereal disease would add cases in such numbers that the rates would no longer reflect accurately the incidence of new infections in personnel under Army control.

The 1943 figure is even more impressive when the rates in past wars are considered, for in all other wars in which this country engaged, the incidence of venereal disease skyrocketed with mobilization and remained high after hostilities had ceased. In the Civil War, the rate reached 214 per 1,000, in the Spanish-American War, 133, while in World War I the rate went to 107 in 1918. Between wars the rates have regularly subsided to comparatively low levels.

The current low rate for the Army has been achieved through collaboration between the Army, Navy, and civilian health and law enforcement agencies. Especially qualified

medical officers have been assigned as venereal disease control officers at large camps and other important commands. The instruction of soldiers has been intensified, civilian sources of infection have been sought out, quarantined, and treated, and vice conditions around military establishments have been subjected to continuous suppressive efforts.

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#### PORTABLE OPTICAL REPAIR UNIT

The Surgeon General's Office decided in the spring of 1943 that a portable optical repair unit should be designed. Reports from overseas had stated that the original mobile optical repair unit was too cumbersome for use in certain combat areas. As on investigation the average life of a pair of glasses in a tank battle was found to be only one hour, it was necessary to have small units that could service glasses in the forward areas. A small unit was designed to include a cutter, an edger, and a stock of frames and lenses, all of which would fit into two standard medical chests (Item No. 97535). With this unit, operated by two enlisted men trained as opticians, it is possible to mark, cut, edge, and assemble lenses, and to repair spectacles in ten to fifteen minutes.

The portable optical repair unit was field-tested in the Medical Department Equipment Laboratory at Carlisle Barracks, Pennsylvania, and then sent to St. Louis for an operational test by the Optical Training Division of the Medical Supply Service School. Based on these tests, it was found that complete glasses could be produced in an average time of twelve minutes.

At present, these units (Item No. 93639) have been forwarded to overseas theaters, giving preference to areas where the Mobile Optical Repair Unit is not practicable. Additional units are now being delivered by the manufacturers and shipments will be made automatically to certain units in the combat areas.

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#### GUIDES TO THERAPY FOR MEDICAL OFFICERS

Guides to Therapy for Medical Officers (TM 8-210), dated 20 March 1942, including Changes No. 1, 6 May 1943, and Changes No. 2, 31 August 1943, has been rescinded.<sup>1</sup> Material of this nature will be included from time to time in War Department Technical Bulletins.

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1. See Circular No. 11, War Department, section V, dated 7 January 1944.

**NEED FOR DATA ON THE DISTRIBUTION OF MISSILE WOUNDS**

More complete and more accurate information is needed regarding the cause and character of battle wounds as well as circumstances attending death and injury. Such data are important for many reasons. They reflect the relative efficiency of military weapons, indicate the need for defensive measures such as body armor, and point the way to better treatment of wounds and more effective medical tactics.

As a result of the interest in this subject in our General Staff, the Ordnance Department, and the Medical Department, a special Ballistics Committee has been organized in the Medical Division of the National Research Council to review the subject and to make recommendations to the War Department. The committee has outlined experimental work and has recommended that efforts be made to obtain better clinical observations of battle casualties.

The data to be recorded on the Emergency Medical Tag and the Field Medical Card both for wounded and killed are outlined in paragraphs 17 and 45c, AR 40-1025, 12 October 1940. Additional data as outlined below are desirable. Where feasible, such observations should be made and the additional data recorded on any suitable stationery or form available and inclosed in the Field Medical Jacket. Comprehensive statistical studies of data obtained from the several sources referred to will be made by the Medical Statistics Division of The Surgeon General's Office. Copies may be retained by the hospital for the purpose of making statistical studies there if desired.

The Surgeon General is requesting the theater surgeons to stimulate interest of medical officers in more accurate observations and records. Special teams may be organized to conduct more elaborate studies if the theater surgeons so direct.

Data on the frequency of wounds with respect to their location in the body are available only for the wounded reaching hospitals. Statistics of past wars indicate a high proportion of extremity wounds, higher than would be expected from the proportion of the body surface represented by that of the extremities. As the dead were not examined,\* it is believed

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From the Office of The Surgeon General.

\*The only data available in the Office of The Surgeon General are those from 1,175 Union soldiers who were killed in action during the Civil War.

that wounds of other parts—abdomen, head, and thorax—fatal to a greater degree, were more frequent than appears in the records. To determine the areas of the body most likely to be hit under various battle conditions including variations in type or types of weapon, kind of action, and terrain, data as to the location of injury, types of missile involved, and extent of tissue damage must be obtained from those killed in battle as well as from those who are reached by medical personnel.

Study of the character and distribution of injuries by type of weapon on all battle casualties or on sufficient numbers to make possible conclusions of value will not only indicate to the surgeon his problem in a given battle, but will be a guide to the commander. It will also be of value in indicating the areas for which the use of body armor should be considered. Similar information obtained from enemy casualties would be of assistance in determining the effect of our own weapons and of value to our commanders.

Certain knowledge has been gained by study of the casualties, living and dead, resulting from bombing raids. This has been of great value in planning medical relief, in devising protection, and incidentally in designing counter-offensive materiel and methods. Little information sufficiently complete to be of value in this regard has been obtained from actual battles.

Such information is often difficult to obtain, but if personnel are made aware of its usefulness they will find opportunities. Medical officers assigned to examine the bodies of the dead before burial may be able to record the location of wounds and determine with some degree of accuracy those responsible for death. Under certain conditions autopsies can be performed and the character of tissue damage determined. Casualties from bombing in rear areas can be investigated more thoroughly than those in the field of battle. Casualties in aircraft which are brought back to the base similarly can be carefully studied.

Information on the kind of action in which casualties occur, including terrain, weather, range and type of weapon, can often be obtained from wounded or other personnel of the



units engaged. This, plus the actual findings in the casualties, gives a more complete and valuable picture of the effectiveness of the weapons concerned.

Considerable knowledge obtained by observation and experiment is available on the effect of small arms bullets. Little is known of the action of fragments of high explosive shell, especially those of small size and high velocity. These fragments are frequently erroneously called "shrapnel." Shrapnel bullets are round balls dispersed from a shell by a bursting charge, and having low velocity, they are relatively ineffective as compared with high explosive shell fragments. So far as can be determined, shrapnel is not being used in this war. High explosive fragments are the most important and most frequently used missiles, and they are the usual cause of irregular and mutilating wounds. Entrance wounds of small size, a millimeter or more, may be caused by a small fragment which because of its high velocity may do extensive and severe damage.

To obtain as much data as possible on the incapacitating power of casualty-producing traumatic agents utilized in warfare, all officers of the Medical Corps are urged to obtain data as is indicated in the outline below whenever opportunity is afforded to do so. These data should be obtained especially from missile wounds caused by bullets, shells, bombs, grenades, antipersonnel mines, etc. The headings in the outline are arranged in the order of their importance.

#### INFORMATION DESIRED

*Name, organization, and serial number.*

*Location of the wounds.* Note: Diagrams, even roughly drawn diagrams, are of great value.

*Wound description.* Describe all wounds, using measurements when possible, and state the shape and the character, such as punctured, lacerated, etc. An opinion as to whether wounds are entrance or exit wounds may be of considerable value.

*Description of the wound track.* This is rarely possible in those killed in action, but occasionally opportunities will present themselves for a thorough postmortem examination. In the living, x-ray findings and data from the operation should be included. Where multiple wounds exist, describe all of them and give an opinion as to the probable missiles responsible.

*Position of the casualty at the time of receipt of the wound.* This can occasionally be obtained especially if the

type of action which occurred at the time of wounding can be determined from the slightly wounded or others of the command who did not become casualties.

*Treatment.* Give briefly the treatment including that which may have been applied by the person wounded. It is also of value to obtain data as to whether the incapacity was immediate on receipt of the injury or whether the casualty was able to continue fighting. In this connection, if consciousness was lost, was this immediate or delayed?

*Remarks.* Describe briefly the type of action, the terrain, the weather, including a statement of the location of the casualty, such as in an M-3 tank, in a foxhole, in a slit trench, etc. It will often be possible after a battle to obtain data from line officers as to the probable range at which the enemy's guns were being fired and in the case of bombs or grenades the distance of the casualty from the burst.

Reports when rendered should be forwarded through medical channels and preferably should cover a given military action or battle. Data from both living and dead should be included in the same report.

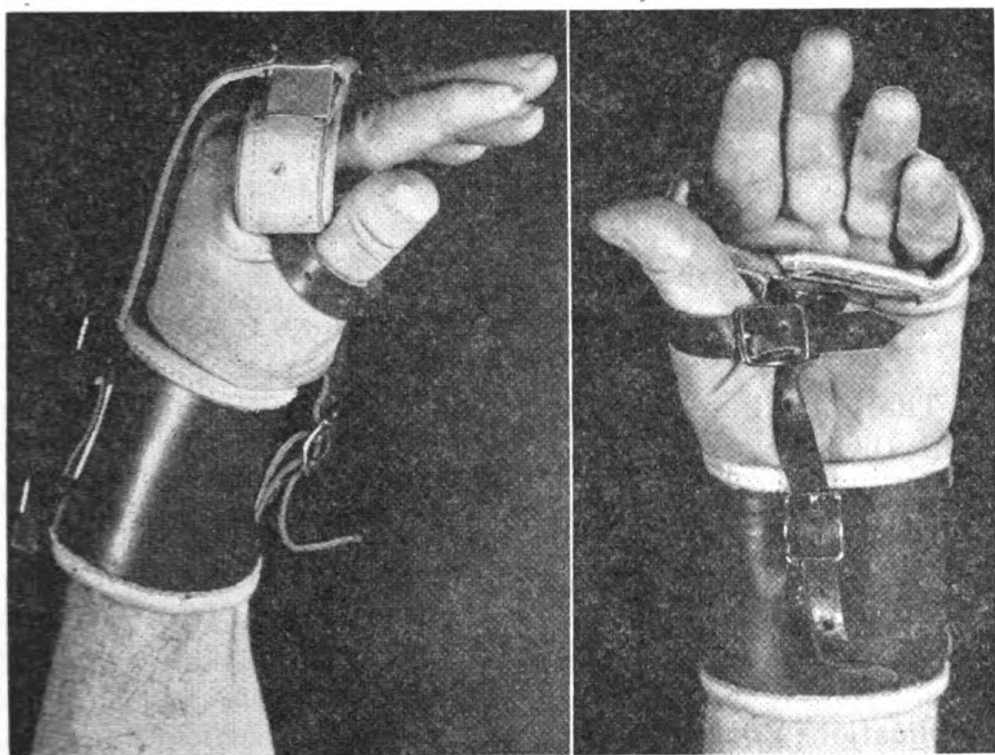
Much information can be gained by a single person but, where the theater surgeon so directs, teams should be organized consisting of a medical officer (a pathologist or a surgeon), two enlisted assistants, an ordnance officer when one is obtainable who has some knowledge of the characteristics of missiles, and a photographer. Personnel of Museums and Arts units which may be available should be invaluable in obtaining photographs and making drawings.

#### DENTAL SERVICE ON A HOSPITAL SHIP

Captain Alexander S. Forster, D. C., who has made many transoceanic trips on hospital ships, reports that the dental facilities on board are adequate and most practical. He states that the ship's dental officer has many opportunities to be of service as a dentist as well as an assistant to the medical officer. The patients, received from evacuation and other hospitals, with fractured jaws have all experienced excellent care and the wiring of the arches has been completed. The nurses have been instructed to remove the intermaxillary elastics when patients become seasick and to replace them when the individual has recovered. Every casualty on board is given a new toothbrush and dental cream. Instructions are given on board in the care of the mouth with the result that gingivitis is negligible.

**SPLINT FOR COMPLETE MEDIAN AND ULNAR NERVE PARALYSIS**

The patient whose wrist and hand are shown suffered extensive laceration by glass of almost all the flexor tendons and the median and ulnar nerves. Primary suture was done and excellent function was obtained in all the extrinsic muscles. The splint illustrated here was applied and the patient was allowed to use the hand as much as possible. Considerable sensory improvement followed but very little recovery occurred in the intrinsic muscles of the hand. The "lumbrical-opponens" cuff completely prevented the development



of the "main en griffe" deformity. This splint can be worn at night allowing the patient full function during the day. Injuries to the flexor surface of the wrist with lacerations involving the median nerve or the median and ulnar nerves require prolonged splinting, at least part time, to prevent development of the usual "monkey hand." This splint has been found to hold the thumb in opposition more satisfactorily than various other types of plaster lumbrical cuffs and special

splints. It was developed in the Brace Shop at Walter Reed General Hospital, Washington, D. C. The specifications are as follows:

Wrist support material	— 2½" wide brown strap leather, lined with horsehide.
2 buckles	¾".
1 buckle	½" (for cuff).
2 straps	¾" wide; long enough to bring wristlet together.
1 strap	½" wide to connect hand grip.
(1) cold rolled steel	¾" x 1/16" to hold hand grip to wristlet. Covered with elk skin and lined with horsehide.
Hand grip material	(1) ¾" x 1/16" cold rolled steel, circumference corresponding to patient's hand measurement. Covered with elk skin and lined with horsehide.
1 strap	½" wide and long enough to restrict movement of thumb.
1 buckle	½" (for back of hand).

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#### PREVENTION OF RENAL COMPLICATIONS IN CASES UNDER SULFADIAZINE THERAPY

The Committee on Chemotherapeutic and Other Agents of the Division of Medical Sciences of the National Research Council recently made the following recommendation: "The incidence of oliguria, hematuria, and anuria following sulfadiazine therapy may prove to be great under conditions where the output of urine cannot be maintained above 600 to 800 cc. per day, as in tropical climates or where a shortage of water exists. It is recommended that under conditions where such complications are being encountered, medical officers administer an initial dose of 4 grams of sodium bicarbonate every four hours regardless of the dosage of sulfadiazine being employed. In the management of complications resulting from the toxic action of sulfadiazine on the kidneys, the administration of even larger doses of alkali, such as 3 or 4 grams every four hours, may be helpful." (*BuMed News Letter* 26 November 1943)

An item entitled, "The Danger of Sulfadiazine in the Tropics," was published in *The Bulletin* of November 1943, page 1.

**REPORT OF BRITISH CONSULTANT TO MIDDLE EAST FORCES**

The report of the British consultant physician to the Middle East Forces, for the quarter ending September 1943, states that about 1,700 military cases of jaundice were admitted to hospitals as compared with 947 during the previous quarter, a rather sharp increase having occurred in September. About 8 percent of these jaundice patients were having arsenical treatment for syphilis. Among the eight deaths from hepatitis, four were cases of arsenical hepatitis and four were simple infective hepatitis, all in African natives. The fatal cases all died from cholemia, becoming confused, drowsy, and comatose, and occasionally having terminal convulsions. The symptoms were associated with a hemorrhagic state, evidenced by bleeding from the gums, hematuria, hematemesis, and purpura; in two cases, cerebral hemorrhage was found post mortem. Patients with definite cholemic symptoms occasionally recovered. The liver was usually small at necropsy in rapidly fatal cases, representing the classical appearance of acute yellow atrophy. In severe cases, the liver is often enlarged and hard, clinically, and may remain so for many months. As the association of jaundice with malignant tertian malaria was not infrequent, when such cases are sent to hospital diagnosed hepatitis, the recognition of malaria is apt to be delayed. Severe anemia in a patient with febrile jaundice, the British consultant stated, should always suggest malignant tertian malaria.

Among other diseases considered in this report is poliomyelitis, sporadic cases of which increased in number during August and September, especially in the Tripoli and Cairo area. Fifteen deaths from poliomyelitis were noted in the hospital reports during this quarter. Poliomyelitis in the Middle East is frequently of the fulminating type, and histologic examination of the central nervous system in fatal cases has shown extensive damage to the brain and spinal cord.

About 50 cases of so-called benign lymphocytic meningitis were observed by an officer in Tripoli, where some officers suspect it is due to sandfly fever; other officers believe that most cases of lymphocytic meningitis in the Middle East are not caused by the virus of choriomeningitis. Possibly

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Ed. note.—When available, penicillin is urgently indicated in generalized staphylococcal infection.

some of them were cases of mild poliomyelitis. It is suggested that cases of lymphocytic meningitis showing definite paralysis, however slight, should be isolated as possible poliomyelitis.

Thirty-nine cases of typhoid fever were reported in this British command in July, 54 in August, and about 200 in September. Among 178 cases of typhoid recorded in British General Hospital Reports, the mortality rate was 13 percent.

Louse-borne typhus declined during the period covered by this report, while murine typhus increased, largely due to an outbreak, the source of which was a piggery infested with rats. It is unsafe to regard mild typhus as murine in Egypt, unless the diagnosis is confirmed by rickettsial agglutination reactions.

More than 8,000 cases of malaria occurred during this quarter in the Middle East forces, about one-third of which were relapses. About 8 percent of all cases of malaria reported were malignant tertian.

Sixty cases of acute epididymo-orchitis of unexplained etiology had occurred in Malta since May. The most likely causes of orchitis were excluded in these cases and no other cause has yet been discovered. The clinical course consists, first, of a short-term fever resembling sandfly fever, next an afebrile period of from ten to fifteen days, and then a second short period of fever with painful swelling of the testis and epididymis, which subsided in a week, although an indurated area persisted in the epididymis and cord in several cases and occasional testicular atrophy occurred.

Staphylococcal septicemia has not been infrequent in the British Middle East forces. Prompt recognition and appropriate treatment of this condition are important. Sulfathiazole combined with blood transfusion often proved successful. The British consultant again mentioned staphylococcal septic anemia because it is so often, at the start, mistaken for some tropical infection.

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**Hospital Ship.**—The *Thistle* (ex U.S.S. *Munargo*) was designated on 29 November 1943 as a military hospital ship, in accordance with international practice, as set forth in the provisions of the Hague Convention X of 1907, to be operated in the future in accordance with the provisions of applicable treaties. (General Orders No. 1, War Department, 4 January 1944)

**PROGRAM ON SCRUB TYPHUS FEVER**

At the monthly meeting of medical officers in the District of Columbia and vicinity at the Army Medical Center, Washington, D. C., 17 January, Dr. Kenneth F. Maxcy, Professor of Epidemiology, Johns Hopkins University School of Hygiene and Public Health and member of the Special Commission on Scrub Typhus Fever, discussed the epidemiology of scrub typhus fever. Lieut. Colonel Joseph F. Sadusk, M. C., read a paper on "Scrub Typhus Fever in New Guinea," prepared by himself and Dr. Francis G. Blake, Dean, Yale University School of Medicine, and Director of the Special Commission on Scrub Typhus Fever. Dr. Blake was unable to attend. These papers were discussed by Dr. R. E. Dyer, Director of the National Institute of Health, and Captain E. G. Hakansson, U. S. N., Medical Officer in Command, Naval Medical Research Institute. The meeting was opened by Major General Norman T. Kirk, The Surgeon General. The speakers were introduced by Colonel Stanhope Bayne-Jones, M. C., of The Surgeon General's Office and Director of the United States of America Typhus Commission. Drs. Blake and Maxcy and Lieut. Colonel Sadusk recently returned from a study of scrub typhus fever in the Southwest Pacific Area.

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**CAUSALGIA**

In the *Archives of Neurology and Psychiatry* of November 1943, De Takats points out that causalgia, although extremely rare in peacetime, frequently complicates wartime injuries. De Takats' paper was abstracted in *BuMed News Letter*, 24 December 1943, as follows:

Causalgia most often follows a mild injury of a peripheral nerve. The mechanism of the vasodilatation that is an essential part of this syndrome is not clearly understood. The possibility that cholinergic nerves are involved is suggested by the fact that the pain is aggravated by injections of prostigmine. The possibility that the vasodilatation takes place in the capillaries rather than in the arterioles is suggested by the fact that improvement follows sympathectomy, a procedure that would normally be expected to increase the blood flow to the region involved. Cooling the limb or arterial compression brings about a decrease in pain through a reduction in blood flow.

In the typical case three stages of the syndrome are present:

1. Severe, persistent burning pain with paroxysmal exacerbations due to jarring, air currents or emotional upsets. The extremity is warm and dry. The subcutaneous and periarticular spaces are edematous, and the muscles are spastic in their effort to splint the painful joint. Oscil-

lometric studies indicate increased blood flow. The painful area is closely limited to the site of the injury.

2. The periarticular edema has spread for some distance; the part may become hard, cyanotic and cold to the touch. The joints are stiff, and the muscles are becoming atrophic. Spotty atrophy of the bone can be demonstrated by x-ray. The blood flow is less active, but still greater than in the nonaffected limb.

3. The atrophy progresses, involving the skin, muscles and bone, with ankylosis. The pain is intractable and may spread in the limbs proximally even to the trunk.

Treatment in the early mild form consists of immobilization and daily injections of 1 percent procaine hydrochloride into the injured area. When the neuralgia has spread beyond the site of injury, and this may take from ten to thirty days, paravertebral injections of procaine should be given and repeated as the relief of pain wears off. When sympathetic block promptly abolishes the symptoms but they recur with undiminished intensity after a few hours or days, sympathetic ganglionectomy should be undertaken. With regard to the upper extremity, injection of the second and third thoracic ganglia gives better results than injection of the stellate ganglia. For the lower extremity, removal or infiltration of the second and third lumbar ganglia is sufficient. The importance of early treatment cannot be overemphasized. Those patients who reach the third stage present a problem in orthopedic and psychiatric care that is almost insoluble and in which the risk of drug addiction or suicide is great.

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**Ocean Survival.**—The newest addition to the "Survival" manual issued by the Army Air Forces' Office of Flying Safety as standard equipment for parachute kits comprises lifesaving methods for airmen forced down at sea. The suggestions are based on actual experiences of flyers who have lived through such emergencies. "Ocean Survival" is combined with chapters on desert, jungle, and arctic survival in a booklet weighing five ounces, designed to cover all contingencies for air crews forced down or compelled to bail out over unfamiliar terrain or water. The latest chapter, by means of text, illustrations, and diagrams, demonstrates the use of special equipment for signaling, fishing, first aid, how to inflate a raft, rig sail, and steer a course. The booklet explains the physiology of the body under these conditions as a basis for making the best possible use of emergency rations, rain water, and food from the sea. Improvisation from the flyer's regular equipment, clothing, and parachute is emphasized. A shirt button, for example, may serve as fish bait or as a substitute for chewing gum to moisten the mouth, while a parachute made into an awning may help save the stranded flyer from sunburn and dehydration. Morale is rated at the top of factors essential for survival. In a list of actual experiences of men is shown the necessity of maintaining high morale and faith in the idea that they will eventually get back.

Issued for the immediate use of tactical and transport air crews of the Army Air Forces, the booklet may find a permanent place in the equipment of travelers on the global airways of the postwar world.



## Special Articles

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### The Division Neuropsychiatrist

The assignment of a neuropsychiatrist to the staff of the division surgeon has been made necessary by the relatively high rate of neuropsychiatric casualties, especially in combat. It represents one of the most progressive moves yet made in military psychiatry. With the exception of induction centers and mental hygiene units in replacement training centers, psychiatric activity in the Army has been confined mostly to hospitals, with emphasis on diagnosis and disposition. In accordance with the policy of The Surgeon General, a new and more effective effort towards the development of preventive psychiatry has been placed in effect. The new division neuropsychiatrist will still have, however, an important responsibility in screening, diagnosing, and accomplishing dispositions. He will have also the opportunity to influence the placement of men, to work at mutual problems with the Judge Advocate and Provost Marshal, to be an advisor in training, and to work intimately with Special Services and morale officers.

A carefully selected group of officers has been assigned to this important duty. They have had from one to three years' experience in psychiatry in the military setting. Each will be the sole representative of psychiatry in a large combat team. It is hoped that this opportunity will prove to be one of the major contributions of psychiatry in the Army of the United States.

The functions of the division psychiatrist are set forth in section V, War Department Circular 290, dated 9 November 1943. This circular outlines clearly the duties and responsibilities of the psychiatrist, but some review and comment are timely.

Ten specified functions are listed. One statement in the introduction deserves special comment: "The neuropsychiatrist is assigned solely to function as such." It is the intention of all concerned in planning this step that a literal interpretation be given this statement. It was demonstrated in World War I that the division neuropsychiatrist could function effectively only when he functioned as a staff officer. In one division, when the neuropsychiatrist was assigned to other routine duties, hundreds of minor neuropsychiatric cases were erroneously evacuated,

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Prepared in the Office of The Surgeon General.

thus wasting much manpower which would have been saved had the neuropsychiatrist been available to care for those patients. Chapter 2, section II, volume X, of the Medical Department of the United States Army in the World War, deals with the division psychiatrist.

Each function of the division neuropsychiatrist listed in Circular 290 will be discussed.

1. *Advise in all matters pertaining to the mental health of the command.* The new division neuropsychiatrists, mostly, are fresh from assignments to Army hospitals. Their work has been with the sick; whereas, in the new assignments their chief concern will be with people who are well. From functioning strictly as clinical psychiatrists, now they must become primarily mental hygienists. While they will have ample opportunity for clinical work, their major interest must be to keep men healthy and fit as fighting soldiers. Their interest must change from the individual to the group. The neuropsychiatrist's influence must be exerted through every officer in the command. The mental health of the division is their major function and must receive the majority of their thought, effort, and time.

2. *Maintain a continuous screening process for the purpose of detecting and promptly eliminating individuals emotionally unfit for military service.* As in hospital practice, the neuropsychiatrist will continue to eliminate unfit men. Perhaps he will be received in the division on the basis that this is his chief and most important function. As he is well acquainted with this procedure, this attitude may be fortunate but it may also prove to be an unfortunate attitude since his chief effort is to salvage men for service. Certainly he will often be expected to "get rid" of men, who he knows must be saved through his clinical judgment, skill, contacts, and influence. On this point, the neuropsychiatrist must reorient his thinking and point of view. True, earlier directives have made it mandatory for psychiatrists to discharge every soldier in whom a diagnosis of even psychoneurosis was made; but manpower shortage has become progressively acute. War Department Circular 293, 11 November 1943, is an attempt to reverse the former practice of wholesale discharge of men. It has become imperative that everything possible be done to salvage men for military service. -

The neuropsychiatrist's duty in part, will be to aid in the placement of men in job classifications in which they can function. For the first time the neuropsychiatrist has a chance to be

a close advisor to the classification officer which in the hospital in large posts was not possible. Through the classification officer, the division neuropsychiatrist will have his first opportunity to guide the placement of his patient.

It is still important that a man who is definitely unfit for any job should not be kept in the Army and should be eliminated as soon as possible. But if he definitely cannot be a combat soldier, there are many other jobs in the Army and every effort should be made to salvage and place him properly.

3. *Be available for the early treatment of normal individuals who suffer from minor correctible maladjustments to Army service.* This function may be a new opportunity for many neuropsychiatrists. Even though it is the aim in the Army hospital, too few had the opportunity to carry on satisfactory therapy. The great majority of our patients were not seen in the earliest stages. In most hospitals the neuropsychiatric section was understaffed and the psychiatrists on duty were kept busy with consultations, making diagnoses and making dispositions.

The division neuropsychiatrist probably will not have time for more than a minimal amount of individual psychotherapy; however, he should attempt as much treatment as he can—and as often as he can. For the first time in the Army, he will have an opportunity in some degree to modify and influence the soldier's environment. He should contact the soldier's unit commander and his noncommissioned officers, and discuss their relationships to the soldier. The importance of arranging rest periods, modifying the daily program, and the granting of furloughs can be pointed out. The opportunity for affecting the morale of the unit will be limited only by the neuropsychiatrist's ingenuity. Group psychotherapy, camp newspaper articles, group discussions, all belong in any broad interpretation of "treatment." Here is placed in the neuropsychiatrist's hands an opportunity to treat remedial conditions without resort to hospitalization. Hospitalization can be reduced and the patient treated in a more favorable atmosphere where it is expected that he will return to duty. All of these considerations are in line with the growing policy of progressive military neuropsychiatrists in attempting to treat patients in the outpatient service and thus prevent hospitalization in numerous cases.

4. *Assist in a program of preventive psychiatry, especially in its relationship to discipline and morale, through educational programs and informal discussions with line officers and others*

*who may seek his advice.* This directive not only indicates the neuropsychiatrist's personal responsibility for morale but gives an important suggestion on how to carry it out. Morale might be regarded as synonymous with mental health, but morale also implies the group direction toward the accomplishment of an aim. There is a direct relation between the state of morale and neuropsychiatric casualties. This fact alone indicates the responsibility of the psychiatrist in the problems of morale.

Neuropsychiatrists are trained to be interested fundamentally in motivation of behavior. Although their clinical interests have been largely confined to the individual, many general principles can be applied to a group. The importance of security, confidence in leadership, group identification, gratification, appropriate direction of aggression, and other dynamic factors should be the educative concern of the psychiatrist. Of the greatest importance is the soldier's understanding of "why we fight."

This directive indicates the opportunity to contact line officers. This is paramount for the neuropsychiatrist. The better he knows line officers, the greater will be the opportunity to help them and for them to seek his advice. This will be particularly true if he will forget psychiatric jargon and explain his findings and recommendations in simple terms. If and when he demonstrates his personal firsthand knowledge of their problems and provides helpful suggestions for their solution, the neuropsychiatrist will become much in demand in the division. Only after he is oriented will the neuropsychiatrist have some valuable and important suggestions or partial answers. As the directive suggests, he should participate in every group activity and every educational effort and training, both formal and informal. It is his assignment to do all in his power to influence the morale of the whole division.

5. *Facilitate reclassification procedures to assure as far as practicable the proper assignment of personnel.* The division neuropsychiatrist will be in a position to recommend the proper assignment of misplaced personnel. Improper placement is a factor in poor mental health. Each division has a classification officer, often a competent psychologist, whose duty is to have full knowledge of the various job classifications and vacancies in them. He is fully aware of the necessity of proper placement and will be anxious to carry out the recommendations of the neuropsychiatrist. He should be one of the earliest contacts and one of his closest contacts. Together they should form a team through

which it will be possible to assign men in the division correctly. Only with his help can the neuropsychiatrist perform his highly important job of salvaging men.

6. *Be available as consultant to courts-martial and other boards where his services are indicated.* In the hospital experience, serving with or on boards was an onerous job which required much time, was often irritating, and left one feeling that little good was accomplished. In courts-martial and Section VIII boards this was partly because of frequent changes in personnel of the board, each contact requiring a new start.

These objections will not be true, for the most part, in the division. In most instances, semipermanent boards are established; it will be the neuropsychiatrist's unit; and perhaps most important, it is a special opportunity to educate the officers on the board in psychiatric principles. Now they will be his own officers. It will be well for the neuropsychiatrist to recast his attitude towards boards.

7. *Visit division dispensaries and advise in management of psychiatric and psychosomatic problems.* A close working relationship with and the confidence of the division surgeon are essential. Only slightly less important are the good will and cooperation of the other medical officers in the division. The visitation of the dispensaries and a regular appointment and time spent in each will pay dividends in opportunities to teach and practice psychiatry. Most medical officers will welcome instruction in psychiatric and psychosomatic problems. Remember that sick call is often an important barometer to the mental health of the command. Also he may be helpful to other medical officers in emergency situations as a physician. This will be returned in large measure when the neuropsychiatrist will need their help in treating battle casualties.

Each psychiatrist is simultaneously a soldier, an officer, a physician, and a psychiatrist in that order. The assignment to a combat division carries responsibilities. Being an officer is synonymous with being a leader; it means a primary interest in the group and participation in a team. The adjustment from civic life to Army existence is a difficult adjustment for new medical officers, but it is essential to the team effort. Being primarily a physician before being a specialist should be axiomatic in or out of the Army. In civil life, the physician dealt with individuals; in the Army he must be concerned primarily with the group. Finally, the psychiatrist is assigned to the division

because he is a psychiatrist. There is no doubt, that for the psychiatrist, psychiatry is his field of greatest usefulness. The chances are that he may never see the occasion when there is any conflict in being simultaneously a soldier, an officer, a physician, and a psychiatrist.

8. *Supervise the maintenance of proper records of neuropsychiatric conditions within the command to the end that adequate information accompanies each patient evacuated to the rear.* The good psychiatrist keeps good records. Their importance in the subsequent care of soldiers should be a continuous goad to do one's best, despite handicaps. Forward medical echelons have developed short, practical forms.

9. *Keep constantly oriented to the changing psychiatric problems during training, precombat, and combat periods, with a view towards developing the mental toughness essential to combat troops.* To know your job means to live with the men, to do what they do, to experience personally their problems and struggles. It means that to be effective he needs to shoot their weapons, ride their vehicles, participate in their bivouacs, take their infiltration courses. In addition to so educating himself, the neuropsychiatrist's interest and participation will gain the respect of the soldier who realizes that the doctor fully understands his problems. It will place him in a most advantageous position which he can get in no other way, being able to apply most effectively his psychiatric skill and judgment to problems of training and combat.

10. *Supervise the management of neuropsychiatric casualties during combat.* In heavy combat the neuropsychiatric casualties are numerous. Treatment to be effective must be as far forward as possible. The directive states that the neuropsychiatrist is "to supervise" their management. Experience indicates that any divisional medical officer may be called on to treat neuropsychiatric cases. For this reason, early efforts in educating them to the rationale and methods are strongly indicated. During the training period, and with an eye to the future, it may be advisable to train one or more enlisted men as assistants. The rationale and method of treatment are described completely elsewhere (S.G.O. Circular Letter 176, dated 20 October 1943).

Division neuropsychiatrists go into their new jobs as pioneers, missionaries, educators, and salesmen. Each one can be a most important factor in the success of a division. They are expected to write a great chapter in American psychiatry.

# The Importance of Streptococcus Infections

This discussion, slightly abbreviated, and the two following on streptococcus infections, were prepared by Lieut. Commander (now Commander) Alvin F. Coburn, U. S. N. R., and are republished with permission from the Navy Department, *BuMed News Letter*. Commander Coburn was Associate Professor of Medicine at Columbia University College of Physicians and Surgeons, New York, prior to current naval medical service. At present he is engaged in an investigation of the streptococcus problem in the Navy.—Ed.

Great outbreaks of acute respiratory infections are cyclical. About every quarter century a pandemic occurs. . . . The probability of another pandemic in 1944 must be anticipated and preparations made to meet this exigency if and when it arises.

The current high rate of respiratory infections is still accompanied by an extremely low mortality rate which is due to the availability of sulfonamides and to the failure of respiratory pathogens to acquire great virulence in 1942 and 1943. It creates a false sense of security. An appraisal of morbidity compels a reorientation in our attitude toward minor respiratory tract infections.

The struggle between bacterial flora and the human host is continuous. Survival of both has been determined by a balanced relationship. In time of war, living conditions of the host are such that this relationship is disturbed, and the balance is now already tipped in favor of the respiratory pathogens. There are at least three ways in which this unfavorable balance may be produced: (a) By the spreading of virus infections of increasing virulence, (b) by the development of bacterial strains resistant to sulfonamide and (c) by an increasing morbidity rate. To date the significant development has been an increasing morbidity rate from respiratory infections and the majority of these infections have been



caused by the hemolytic streptococcus. Again, as in World War I, the versatility of the hemolytic streptococcus is underestimated. . . .

The realist who evaluates the activity of the hemolytic streptococcus focuses his attention on man-days from proven or probable streptococcal diseases. This is 10 times the loss from gonococcal infections and their complications.

Sulfonamide therapy will not solve the problem of the time lost to *Streptococcus hemolyticus*. The first objective must be to reduce to a minimum the loss of man-days. This can be effected, but only through the courageous and vigorous execution of all available preventive measures.

Some of these measures were discussed by the author in a paper appearing in the *Naval Medical Bulletin*, July 1943, p. 1012. These include separating new recruits from other personnel, isolating all patients with streptococcal respiratory infections with the same vigilance given scarlet fever cases and avoiding, as far as possible, overcrowding and poor ventilation. It is apparent that certain individuals, usually those whose respiratory infections remain subacute for a considerable period of time, harbor organisms which possess the characteristics of ready transmissibility and increased pathogenicity and are therefore "dangerous carriers." Such individuals should be sought out and carefully isolated. Streptococcal infections are acquired in most instances in the sleeping quarters. The pathogenic organisms are on the floor and bedding. Transmission occurs during sweeping and bed-making. To prevent the dissemination of respiratory pathogens, *dry sweeping must be eliminated*. Sweeping should be done only when the sleeping quarters are empty. In hospital wards and in sleeping quarters the windows should be opened and provisions made to lay the dust during the sweeping of decks. This can be done by spreading wet or oiled sawdust on the deck or by using a damp broom.

The problem of prevention becomes more difficult when streptococcal outbreaks occur in sleeping quarters or in hospital wards. The use of ultraviolet light and aerosols is still in the experimental stage. There is good evidence that under epidemic conditions sulfonamide prophylaxis will protect against streptococcal respiratory tract infections. (*BuMed News Letter*, 26 November 1943)

## Versatility of the Hemolytic Streptococcus

Of all the organisms pathogenic for man probably none produces a greater variety of disease manifestations than the *Streptococcus haemolyticus*. The versatility of this streptococcus can be attributed to its extraordinary capacity to synthesize a number of substances which react with human tissues. Some of these substances and their effects have been identified. Erythrogenic toxin when elaborated in high concentration produces a scarlatinal rash in susceptible (Dick-positive) individuals. Two streptolysins (one oxygen labile and the other oxygen stable) lyse human erythrocytes. Fibrinolysin dissolves human fibrin. These and other soluble products of the bacterial cell make possible the invasion of tissues. The effects of the cellular constituents are at present more obscure. It has been shown, however, that streptococcal nucleoprotein is a sensitizing agent. Other proteins make possible serological typing, and the presence of a carbohydrate permits serological grouping.

The development of streptococcal manifestations depends on at least three factors: the capacity of the organism to produce substances which react with human tissues, the reactivity of the host to these substances, and the environment. All three of these factors are constantly changing variables. The influence of environment is modified by season and geographical location. The reactivity of the host is influenced by age and previous experiences with the hemolytic streptococcus. The capacity of the microorganism to produce tissue-reactive substances fluctuates with passage from host to host. The accumulated effect of these variables is the protean clinical picture of streptococcal disease. This can best be appreciated by following the activities of a single strain of hemolytic streptococcus in a closed colony. For this purpose a hypothetical epidemic will be described. This hypothetical streptococcal outbreak is described as it might have occurred at a boys' school.

Our imaginary boys' school matriculated 226 boarding and 35 day students between the ages of 12 and 17. During the Christmas holidays one of the boarders contracted scarlet

fever at his home. His illness was mild, and he returned to school twenty-four days after the onset of infection. On resuming his school activities, he found that he had a cough and felt tired during physical exercise. On January 25, ten days after this boy returned to school, another student developed a severe attack of acute tonsillitis. This was followed by a series of infections occurring through February and March to April 6. All of these diseases, including the original source of infection, were identified as due to hemolytic streptococcus Group A, type 13.

This outbreak began insidiously with throat infections, two to five a week. In the third week of February, however, the seriousness of the epidemic became apparent when 22 boys were admitted to the school infirmary, and the weekly incidence of streptococcal diseases continued to be high until the latter part of March when the epidemic subsided. The final case of tonsillitis occurred on April 6 when the epidemic ended spontaneously. The striking observation during this epidemic was that, of the 90 type-13 respiratory infections, all but two occurred among the pupils who boarded. Two day pupils contracted pharyngitis and three members of the family of one of the teachers became ill. This family had entertained many of the students including the boy believed to be the original focus. The teacher's small son contracted bronchitis. A few weeks later his wife developed sinusitis which was followed by puerperal sepsis two days postpartum, and his elderly mother developed erysipelas.

There were a number of complications in March. Several of these required operative interference, two laparotomies, one thoracotomy and one mastoidectomy. There was one death in an older boy who developed bacteremia following pharyngitis and who at autopsy was found to have an acute bacterial endocarditis on a healed rheumatic mitral stenosis. There were also four complications in April. Two boys, about three weeks after recovery from mild pharyngitis, developed rheumatic fever. One boy, following cervical adenitis, had acute hemorrhagic nephritis, and another boy, seven days after acute tonsillitis, manifested erythema nodosum. Altogether there were twenty-three different diseases associated with this outbreak of hemolytic streptococcus type 13 infection. They are tabulated as follows:

Primary infections		Septic complications		Sensitization sequelae	
Diagnosis	Number of cases	Diagnosis	Number of cases	Diagnosis	Number of cases
Tonsillitis	22	Pneumonia	4	Rheumatic fever	2
Pharyngitis	21	Cervical lymphadenitis	4	Acute nephritis	1
Catarrhal fever	18	Otitis media	3	Erythema nodosum	1
Scarlet fever	8	Pansinusitis	2		
Bronchitis	6	Peritonitis	1		
Tracheobronchitis	5	Mesentery lymphadenitis	4		
Rhinitis	4	Empyema	1		
Tracheitis	3	Mastoiditis	1		
Laryngitis	2	Puerperal sepsis	1		
Erysipelas	1	Endocarditis	1		
Total:	10	90	10	19	3
					4

In summary, one strain of hemolytic streptococcus serologically identified as type 13 initiated an outbreak of 90 infections complicated by 19 suppurative diseases and 4 sterile inflammatory processes. Such an epidemic calls attention to many of the disease manifestations of *Streptococcus haemolyticus*. Epidemics similar to this hypothetical outbreak have occurred frequently at naval training activities and demonstrated the versatility of hemolytic streptococcus as a human pathogen. (*BuMed News Letter*, 24 December 1943)

## Principles Involved in Care of Patients with Streptococcal Diseases

There are essentially two major problems in the handling of naval personnel with hemolytic streptococcal infection: (a) treatment of the various manifestations induced by this bacterial agent; and (b) prevention of dissemination of this organism, which ordinarily gives rise to cross-infections and return cases. The present discussion is confined to the former.

Intelligent handling of patients with streptococcal infections requires first an appraisal of the following points: (1) Is the infection primary or secondary; (2) if primary, are the manifestations associated with the absorption of toxin or due to invasion of tissues; (3) if secondary, is the process in the cellulitis stage, has suppuration occurred or are the symptoms

due to a hypersensitive reaction to an infection which has already subsided. Awareness of the variations in pathogenicity of hemolytic streptococci, a clear understanding of the natural history of the different types of streptococcal infections and an evaluation of the character and stage of the disease process in the individual patient facilitate rational care of the protean manifestations of streptococcal diseases.

Most primary streptococcal infections are mild upper respiratory tract diseases which subside spontaneously in three to five days. Irrespective of the form of treatment, about 10 percent of these infections give rise to complications, and no method has yet been found for preventing the development of these complications. Bed rest, forced fluid intake, warmth, and supportive measures probably insure the most rapid and complete recovery. If the local upper respiratory tract infection gives rise to severe toxic symptoms, there is a great temptation to administer serum or sulfonamides, and this is especially true in scarlet fever. Patients with scarlet fever have already absorbed erythrogenic toxin from the infectious agent. Sulfonamide will not modify the reaction of the patient to this toxin. A potent antitoxic serum will modify the reaction, but only if the available serum has neutralizing antibodies for the toxin elaborated by that particular respiratory pathogen. This holds true also for the efficacy of convalescent human serum which, furthermore, is always of low titer. Frequently, toxic symptoms are associated with dehydration and are promptly relieved by infusions of 0.9 percent saline and 5.0 percent glucose. A throat infection may also be caused, however, by a highly invasive strain which produces marked hyperplasia of lymphoid tissue, edema, and peritonsillar swelling. In essence, such a lesion is a local cellulitis and the symptoms associated with this marked inflammatory reaction are amenable to sulfonamide therapy.

This invasive tendency is characteristic also of the relatively rare, severe primary infections, such as lymphangitis, erysipelas, cellulitis, etc. The natural history of these infections is bacterial multiplication, spreading, and invasion of the blood stream. Sulfonamide therapy will prevent multiplication of the bacterial cell; prompt and intensive chemotherapy may well be a lifesaving measure under these conditions.

The treatment of secondary infections is complicated by the fact that purulent exudates act as sulfonamide inhibitors.

The effectiveness of chemotherapy will, therefore, depend on the character and the age of the lesion. Early in the course of suppurative processes, when the invasion of tissue is the predominant factor and before the formation of pus, chemotherapy can be expected to be highly effective. This is most striking in cervical lymphadenitis, otitis media, early mastoiditis, and pneumonia. When, however, the suppurative process is well established, the quantitative balance between the sulfonamide effect and the local antagonistic effect of purulent exudates is in favor of the latter. It is for this reason that drainage is indicated for abscesses, purulent otitis media and mastoiditis, empyema, etc. With the establishment of drainage, the lesion is relieved of sulfonamide inhibitors, and chemotherapy is then highly effective in preventing the spread of infection and perhaps also in the healing of the disease process.

Streptococcal diseases associated with hypersensitivity occur about one to three weeks after antigen has been absorbed from a primary infection. To attack these diseases by treating the precipitating infection is comparable to repairing a defective chimney flue when a house is ablaze. Attention must be directed to the particular hypersensitive reactions of the host. A severe epistaxis may require prompt cauterization; whereas, erythema nodosum will subside spontaneously and promptly if the affected part is elevated. The fact that hematuria is so often the presenting sign in acute nephritis has tended to focus attention on the kidney. It is important, however, to bear in mind that the changes in the glomerular capillaries are only a part of the many manifestations of capillary damage throughout the body, as evidenced by epistaxis, pulmonary and cardiac involvement, transitory localized accumulations of edema, and edema of the brain. Perhaps the most important manifestation with respect to the care of the patient may be cerebral edema. This develops rapidly and early recognition of this phenomenon and appropriate treatment with infusions of hypertonic fluids may be lifesaving. When the capillary changes in the glomeruli are marked, varying degrees of renal insufficiency may supervene, but this insufficiency barely reaches a degree that is dangerous to life. Acute nephritis customarily subsides with bed rest.

When secondary streptococcal infection persists after the development of acute nephritis, there is no contraindication to treating this infection with sulfonamides. This is not true, however, for rheumatic fever. Either manipulation of tissues of the upper respiratory tract such as tonsillectomy or the administration of sulfonamides during rheumatic fever will probably increase the activity of the rheumatic process and may cause a fatal exacerbation in an individual with mild symptoms. Rational handling of the rheumatic patient entails (a) suppression of disease activity and (b) protection of the myocardium. To effect the former, a therapeutic program for the administration of salicylates adequate to assure a prompt return of the blood sedimentation rate to within normal limits is indicated. The latter objective can be attained only through bed rest until the disease has become quiescent and reparative processes have advanced to a degree that the demands of an ambulatory life will not exceed the available myocardial reserve. (*BuMed News Letter*, 7 January 1944)

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## Treatment of Blackwater Fever\*

Blackwater fever occasionally supervenes during an attack of malaria. Although the etiology is not fully understood, the serious and dramatic attack seems to be precipitated by the administration of antimalarial drugs in those who have been infected for some time with malaria, usually of the malignant tertian type. Those cases which are going to develop blackwater fever cannot be predicted nor is it possible to forecast the course. The initial crisis may subside completely or may be followed by succeeding attacks. The mechanism of the disease is a sudden intravascular hemolysis which is manifested by hemoglobin in the urine, pyrexia, vomiting, loin pains, and jaundice. The cells of the kidney tubules become damaged and disorganized, and the tubules become plugged with cellular debris and with insoluble products which appear to be precipitated particularly when the urine is acid; because of this, some advocate the administration of alkalis as a routine in the treatment of acute malaria. The cause of kidney failure in blackwater fever is not exactly clear; it was thought to be due to simple blockage by precipitated products resulting from the hemolysis, but it is possible that

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\*Abstract of an article by Murgatroyd, F.: *The Modern Treatment of Blackwater Fever*, Med. Press and Circ., Lond., pp. 58-60, 28 July 1943.



some obscure toxic action resulting in damage to the renal epithelium plays an important part.

The anemia thus speedily produced is of grave concern. The amount of hemoglobin in the urine represents only a small part of the blood destroyed, as the major portion is taken up by the reticulo-endothelial cells. Death may occur in the early stages from acute anemia or from hyperpyrexia associated with the sudden liberation into the plasma of substances from the hemolyzed corpuscles. As the kidney fails, the urine becomes diminished or entirely suppressed, there is nitrogen retention, and death may occur in the later stages from uremia.

Murgatroyd has suggested certain measures, based on pathological and biochemical studies, for minimizing the damage of the attacks and for restoring the patient to health. Since with the onset, the malarial parasites almost always disappear from the blood, antimalarial treatment should be stopped at once. The anemia in blackwater fever occurs so quickly that the body has no time to become adequately adjusted, and slight exertion may be followed by cerebral anemia or fatal myocardial inadequacy. Absolute rest in bed is, therefore, the first essential in treatment, and even though conditions under which the patient is being treated are primitive, it is best to treat him on the spot rather than to subject him to the strain of being moved elsewhere for treatment. The patient should be encouraged to take as much fluid as possible to dilute the urine and to minimize the precipitated products in the renal tubules resulting from the hemolysis. An initial dose of 120 grains of sodium citrate followed by doses of 60 grains every two hours, well diluted in water, may be given by mouth until the urine is alkaline, when the dose may be reduced and adjusted to keep the urine alkaline. To alkalinize the urine rapidly, 150 cc. of 3.8 percent sodium citrate solution or 20 cc. of a mixture of equal parts of a saturated solution of sodium bicarbonate and a M/3 solution of sodium lactate may be given intravenously. As sodium bicarbonate solutions may undergo hydrolysis on heating, they should be sterilized by filtration. All intravenous injections should be made with extreme slowness lest pulmonary edema or circulatory failure supervene. The sudden anemia may necessitate blood transfusion. The pyrexia is best controlled by sponging. Morphia may be required for general distress and restlessness, but where there is evidence of renal insufficiency, it must be used with caution. Convalescence must never be hurried, as deaths have

occurred from too early attempts to regain activity. Patients who have had blackwater fever may develop it again in further attacks. The danger from malarial relapse may be avoided by antimalarial therapy carefully begun from seven to ten days after the hemolysis has ceased. Any further relapse should be treated with atabrine in preference to quinine.

## The Care of Tuberculous Patients Pending Discharge from the Army

The Army annual hospital admission rates for tuberculosis reflect the success of induction station examinations in excluding this disease. A transient rise in the rate occurred in the early months of the current mobilization, when x-ray examination was not universal in induction stations and when personnel in stations with equipment for mass x-ray examination were not yet experienced in the procedure. The average annual admission rates per thousand men in continental United States for the last three years, calculated for six-months periods, were as follows:

Jan.-June	July-Dec.	Jan.-June	July-Dec.	Jan.-June	July-Dec.
1941	1941	1942	1942	1943	1943
1.6	2.0	2.1	1.4	1.3	1.1

The average admission rate in continental United States in World War I, calculated from the monthly admission rates from April 1917 to December 1919 was 13.0. In January 1918 the rate reached a peak of 27.5.

In spite of the evident great improvement in the second major mobilization, it is a fact that the means available in induction stations should have led to even better results. The admission rates cited in the preceding paragraphs for the most part represent errors in induction. Reviews, made by sampling filed films of accepted men, reveal an incidence of undetected tuberculosis comparable to the current admission rate. Fortunately, as shown by recent special studies, many of the cases admitted to the Army through error are detected promptly at Army posts and hospitalized pending discharge.

Army Regulations (AR 615-360, C 16, dated 15 December 1943) require that enlisted personnel with active tuberculosis, unless terminal cases, be separated from the service. Exceptions are made in the case of personnel nearing com-

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Prepared in the Office of The Surgeon General.

pletion of twenty years' service and noncommissioned officers of the first three grades when the prognosis is favorable for complete recovery and restoration to duty within one year. Such individuals are transferred to the Fitzsimons General Hospital or other designated Army hospital for treatment. The majority of cases in enlisted men, however, are transferred as rapidly as circumstances allow to the veterans' facility nearest the tuberculous soldier's home.

The period required for this transfer varies but averages about five weeks. About three weeks are spent in the necessary procedures for discharge on certificate of disability and clearance of the case through the Veterans' Administration, with designation of the veterans' hospital in which final separation from the service is to be accomplished. A further delay of two weeks commonly ensues before proper railroad transportation, ensuring the legally prescribed isolation, is obtained.

#### THE CRUCIAL PERIOD

The several weeks preceding entrance in a veterans' hospital represent a crucial period for the prognosis of each case. If the soldier is well impressed with the seriousness of his disease and appreciates the opportunity afforded for recovery, he will enter the veterans' facility well prepared for the long course of treatment universally recognized as essential in the complete arrest of tuberculosis. On the other hand, if his treatment in a station hospital, pending his discharge, is casual or dilatory, he will be a poor patient when he reaches the veterans' hospital.

Unfortunately, experience in veterans' hospitals throughout the country indicates that a high proportion of tuberculous soldiers are not properly indoctrinated on the need for prolonged care when they leave Army station hospitals. A questionnaire recently circulated by the Veterans' Administration through its several tuberculosis hospitals revealed that the majority of newly arrived patients are unwilling to take full advantage of the treatment available. Such patients, as a rule, are not acutely ill, and the attraction of renewed independence, with a financial disability allowance, outweighs all arguments on jeopardy to their health.

One remedy for this condition is improvement in Army hospital supervision of cases of tuberculosis in the period between diagnosis and discharge. The major principles in

the therapy of tuberculosis are well known to all medical officers. The cardinal one is rest. This simplest of all treatments must be recognized as a positive, not a negative, measure. There is a vast difference between a soldier's willing acquiescence in purposeful bed rest and aimless sitting around in hospital wards awaiting discharge. Ward officers in charge of cases of tuberculosis should use the weeks pending separation from the service as a period for essential education. Every soldier with tuberculosis should know that this disease tends to progress insidiously and that a few weeks of carelessness may make any treatment too late. In addition he should be made thoroughly acquainted with the fact that tuberculosis is a communicable disease and that his failure to take treatment when he reaches the veterans' facility provided for him will not only endanger his own health but make him a source of spread of tuberculosis to his family and other close associates.

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## Trench Foot

Trench foot, immersion foot, and frostbite are related conditions resulting from exposure to wet and cold. The disastrous effects of these weather hazards on military operations have been demonstrated in previous wars. A high incidence of frostbite and trench foot seriously crippled Napoleon's army in the Russian campaign and undoubtedly contributed to its tragic end. Indeed, Napoleon's Surgeon General Larrey gave the first, and now classical, description of trench foot. In World War I, the British suffered heavily from these conditions on the Western Front, and in Gallipoli, where during the crucial period of that campaign, 7,982 admissions to hospital from these causes gave a ratio of 68.18 per 1,000 of strength. In the British Expeditionary Forces in France and Flanders during the winter of 1914 and 1915, more than 29,000 patients were admitted to hospital with these conditions.

These injuries from exposure to cold deserve serious consideration in the present war. Reports from the Russian front indicate that the Germans have suffered heavy casualties from these hazards. In the American forces it has not been a grave

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Prepared in the Office of The Surgeon General.

menace except in certain quarters. In the Eighth Air Force, high altitude frostbite was the second most frequent cause of battle injuries. In the Kiska campaign, immersion foot and trench foot comprised about 10 percent of the total injuries and diseases. In the Attu campaign, 93 cases of immersion foot or trench foot required admission to hospital. These hazards from exposure to cold may assume increasing importance.

Trench foot occurs as a result of prolonged exposure to wet and cold. Contributing factors are tight footgear, immobility, and dependency, which reduce peripheral circulation. Treatment is not very satisfactory, and, in even relatively mild cases, recovery may take weeks. In the British Expeditionary Forces in the last war, the average number of days in the hospital of these patients was 38.6 for officers and 75.6 for other ranks.

Prevention is of paramount importance. Proper prophylactic measures are highly effective and can practically eliminate this condition. In the British First Army, from December 1914 to February 1915, the weekly incidence of trench foot was between 300 to 600 cases. However, after strong disciplinary measures had been taken to prevent its occurrence, the disease became more or less negligible. Prevention consists not only in providing proper equipment for operations in wet, cold regions, but also in the careful instruction of personnel in protection against the hazards of exposure to wet and cold. The efficacy of these measures will depend on how rigidly they are followed, which, in the final analysis, is a measure of discipline and is the responsibility of unit commanders.

The most important steps in prophylaxis consist essentially of conserving body heat and avoiding unnecessarily prolonged exposure of the feet to moisture, coldness, and other factors that decrease peripheral circulation. Loose-fitting waterproof boots with replaceable thick felt innersoles and woolen socks should be worn to provide good insulation as well as ventilation. Every effort should be made to keep the feet dry and if the socks or innersoles become damp or moist as a result of perspiration or prolonged immersion in wet mud or snow, they should be replaced by dry ones as soon as possible. Cramped positions, dependency of extremities, and constriction by tight clothing, socks, shoes, and leggings should be avoided.

The principles of treatment have been described in a previous publication\* and consist essentially of rest, avoidance of local trauma and infection, elevation of the feet to promote drainage of edema fluid and reduction of metabolism in the affected parts. The patient should be kept in bed with the lower legs and feet elevated on pillows slightly above heart level and protected from external pressure either by complete exposure or by means of a cradle. The period of bed rest is determined by the degree and rate of subsidence of edema and circulatory disturbances. Whereas the individual should be kept comfortably warm, maintenance of minimal tissue metabolism in the affected parts is important and the application of external heat to the feet must be avoided. In certain cases in which pain is prominent and persistent, actual cooling of the limbs may be indicated. Massage or rubbing of any sort in the early stages and all antiseptics and ointments should be avoided. The part should be handled as little and as gently as possible. Measures to prevent secondary infection, including tetanus, should always be instituted, and in cases with threatening infection, sulfadiazine by mouth should be used. Areas of necrosis and ulceration which may subsequently develop should be treated conservatively until surgical intervention becomes necessary.

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\*A special article on immersion foot, including treatment, was published in The Bulletin in November 1943, page 26.



A medical officer checking the sick call book at a first-aid station in North Africa.

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Photograph by U. S. Army Signal Corps.

# Correspondence

## SERVICE ON THE ALASKA HIGHWAY

The following letter written by a medical officer who served along the Alaska Highway, was addressed to a medical officer in the Office of The Surgeon General.

13 October 1943

I was a battalion surgeon with an Engineer Regiment engaged in constructing a section of the Alaska Highway. Our medical problems generally were minimal. The personnel was young and robust, and its stamina, probably due to continuous hard work, increased rapidly. The two particular problems at first were minor injuries, especially ax cuts, and anxieties and conversion symptoms. The latter invariably cleared with psychotherapy, consisting essentially of mild autocatharsis and encouraging the soldier to feel that he could come to me as a physician rather than as an officer. Most of them became adjusted with surprising rapidity as they became physically stronger and acquired self-confidence.

This regiment had been inoculated against yellow fever and about 10 percent of the command developed jaundice at a time when we were 40 miles from the station hospital. Evacuation was difficult because transportation was poor, and the hospital was reluctant to accept any but seriously ill patients. These soldiers, therefore, were carried on a quarters status for three or four weeks. Practically all of them accepted the situation with tolerance and good cheer. Seemingly, their convalescence was hastened when some B-complex was made available. By this time, they were in fine fettle and had become adjusted to the mode of living and to the B Ration diet. Home and women were common topics of conversation, and dice, poker, and blackjack, the chief sources of entertainment. My duties consisted chiefly of caring for minor injuries. Repeatedly men were involved in accidents which one would expect to cause loss of life or limb, and yet they would escape with comparatively slight injury. Their excellent physical condition possibly was a protective factor.

While the entire personnel was dissatisfied with the diet, no man showed any indication of significant avitaminosis or weight loss. Occasionally moose, bear, prairie chicken, caribou and deer meat, and fresh fish were available. Although intestinal disturbances were uncommon, excessive flatus was almost universal, due apparently to the high carbohydrate content of the diet; later, some fresh foods were issued. An issue of beef was a gala occasion.

Frostbite of the toes threatened to be a problem, but the quartermaster solved it by replacing the shoe-pac type of footwear with felt shoes and arctic overshoes. The arctic clothing is well designed and adequate. On only one occasion did I face a serious problem. Severe Vincent's infection hit forty men in one company, prostrating all of them. They had engorged and ragged tonsils and an intense hyperemia of the fauces highly suggestive of a secondary streptococcus infection. Their temperatures were between 102° and 103°. Inasmuch as housing and bedding facilities were



poor, and the average temperature was 30° below zero, I administered sulfathiazole in full dosage more or less as a prophylactic measure. To my surprise and gratification, all of them improved within forty-eight hours, and the majority were back to duty in seven days. The outbreak, I believe, was brought about by the use of tepid water for washing mess kits. Use of open burners in the mess hall had been forbidden because of the fire hazard. Suitable facilities were established soon. The response to sulfathiazole was striking, in view of the clinical picture and the dubious reports about its efficacy in this condition. I was impressed by the fact that no cases occurred in soldiers without tonsils.

After the road was opened, the new troops brought with them new problems. Acute contagion, especially exanthemata, which heretofore had not been seen, was common. The station hospital was crowded. The limited service men in a quartermaster regiment, especially arthritics, developed symptoms, I was told that many were evacuated to the States. Concomitant with return of men from furloughs, venereal disease, which previously had been rare, became not uncommon. Generally, ambulatory treatment of gonorrhea on a duty status was fairly satisfactory. Being 150 miles from the station hospital, I wondered what I would do if faced with an acute appendicitis. The choice of personnel and equipment was based apparently on the table of organization. It might have been advisable to have a more flexible setup, based on the particular situation.

From this fifteen-months experience, I have mentioned only a few of the more important situations. Many thanks for your kind letter.

### OVERSEAS WITH A LABORATORY

The following letter written by an officer serving with a medical laboratory in North Africa was addressed to a laboratory officer in the United States.

Sorry I didn't cover all of the subjects when I wrote before.\* Apparently you expect to start places before long. I would suggest that you do not bring too much personal clothing although a great deal will depend on where you go. Clothing is available over here. My suggestion would be, overcoat and short coat, or one of the two; one pink and one green; about 3 dress shirts to go with the blouse; two pairs of service shoes and one of oxfords. Bring a service cap and a couple of garrison caps (winter) and a couple of garrison caps (cotton); about 3 O.D. shirts and 3 O.D. trousers (woolen); plenty of socks both cotton and wool; and the same of underwear; forget about pajamas and bathrobes. Bring about 5 summer uniforms and a raincoat. Galoshes will come in handy wherever you are—sorry I didn't bring mine. You can always get replacements. Razor blades and toilet articles are available here, so don't stock up on them. Suggest you get a sleeping bag and a rubber air mattress if possible; they come in right handy.

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\*The Bulletin of the U. S. Army Medical Department, November 1943, p. 88.

During transit, which probably will cover quite a while, you will have to do your own laundry. Suggest that you give each enlisted man a couple of bars of laundry soap to cover emergencies during that period. You can always hire a native to do your laundry here. Have a couple of electric or flat irons with you and slip a washboard in with your equipment if you can. Dry cleaning and Gov't laundry service will depend on where you go. In this area, a fixed G.I. laundry has been established which does finished work and dry cleaning. It costs enlisted men 40c a bundle of 20 pieces. Dry cleaning and officers' laundry are about the same prices as in the states. Incidentally, we have prisoners washing the equipment and doing police, mess, and utility work. They are very efficient. We enjoy having them.

In regard to supply, suggest that when your shortages are reported to the surgeon, you also report what you need in the 17,000 item—that is very important; also if they figure on N.S. products they arrange for them. We did neither and have had some trouble over them.

Since we are operating more as a service command lab. than an Army or C.Z. lab. we have gone way over our T/E on equipment and supplies. All 17,000 items in this area are kept by us and issued by us. It was quite a job gathering them up from as far away as ———. Most of them are collected now.

Have not seen the new T/E; as a result we have a microtome minot and a microtome clinical on memorandum receipt; also another refrigerator (looks like we'll have to get a third), extra autopsy instruments, Wassermann bath, buckets, wash pans, microscopes, darkfield apparatus, and incubators. Have almost as much on memorandum receipt for the headquarters lab, as we have on T/BA. We are flirting with the idea of trying out the ordnance repair truck as a mobile lab. unit; it looks like it would be an ideal unit to convert, but an O.K. has not been obtained on that yet.

We had to have extra stools and tables built. During September the lab. did about 7,200 pieces of work. During the summer we've had many malaria slides. Bacteriology and serology have been extremely busy. Chemistry got off to a slow start but is now doing biochemistry, toxicology, and work on petroleum and beer and a small amount of liquor. Pathology has been very busy and is sending thru a large amount of paraffin blocks for the museum. Veterinary has not had too much on food problems, and a small amount of parasitology. We had to get animals to make antigens. The work has been so heavy that we haven't sufficient room. They are building us a new building in a hospital center that has been established here. They are also building a special animal house. We have used a mobile unit only once so far.

When you get here, you will have to take over all the administrative jobs. I'm detachment C.O., supply officer, personnel officer, motor officer, P & T officer (they do that here too), PX officer, and censor. I missed the mess officer's job. Hope this will be of some help to all of you.

## Original Articles

### Treatment of Burns Due to Chemical Warfare Agents

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Clinical experience in the treatment of burns resulting from chemical warfare agents has been limited to isolated reports during the present conflicts.<sup>1 2</sup> If war gases are extensively employed, the management of such casualties would be of paramount importance and the vesicant agents, chiefly mustard and lewisite, would probably play a dominant role.

In this paper our clinical experiences are set forth in treating 95 burns of the skin caused by chemical warfare agents, serious enough to warrant hospitalization, and a comprehensive plan of management, which anticipates problems arising as a result of burns due to these agents, is presented. The general considerations, pathology, history, and classification of chemical warfare agents have been discussed elsewhere.<sup>3 4 5</sup>

TABLE I

Chemical agent	Degree of burn			Total	Total days hospital-ized	Av. days hospi-talized	Mortality rate
	1°	2°	3°				
Mustard gas	5	41	19	65	835	12.8	0
Lewisite gas	2	14	4	20	115	6	0
Nitrogen mustard gas		2		2	35	17.5	0
White phosphorus		3	3	6	110	16.7	0
Arsenic trichloride		1	1	2	41	20.5	0

Photographs by the U. S. Army Signal Corps.

1. Grant, James, and Ritchie, T. F.: Mustard Gas Burns, Brit. M. J., 2:217-218, 22 August 1942.

2. Amyl Salicylate in the Treatment of Mustard Gas Burns of the Skin, Ministry of Health, England, Bulletin of War Medicine, 3:170, November 1942.

3. Medical Manual of Chemical Warfare. London: Great Britain War Office, 1942.

4. Prentiss, A. M.: Chemicals in War. New York: McGraw-Hill Book Co., 1937.

5. Bulletin of the New York Medical College, 5:33-137, June-Oct. 1942.

In these patients the agents producing burns were mustard gas, lewisite gas, nitrogen mustard gas, white phosphorus, and arsenic trichloride\* (table I).

#### TREATMENT

*Mustard gas*—Bis-beta dichlorodiethyl sulfide ( $\text{ClCH}_2\text{-CH}_2\text{)}_2\text{S}$ . Mustard gas, or mustard agent, is an oily, liquid vesicant with an odor of garlic, mustard, or horse-radish. It is very persistent, has great powers of penetration, and because of its lipoid solubility finds easy entrance into the skin. One of the most malignant features of this gas is delayed irritation on contact with the liquid or vapor. Early signs and symptoms do not appear until after a lapse of hours, by which time it is too late to ward off the effect of the gas, and a casualty results. It is characteristic for the patient to report to the dispensary or hospital four to twenty-four hours after leaving the job and to have no recollection or information as to how, when, or where the exposure occurred. Ninety-four percent of our burns due to mustard did not realize they had been contaminated until from six to twenty-four hours later. The first indication of such a burn was pruritus and erythema followed by pain about the contaminated area.

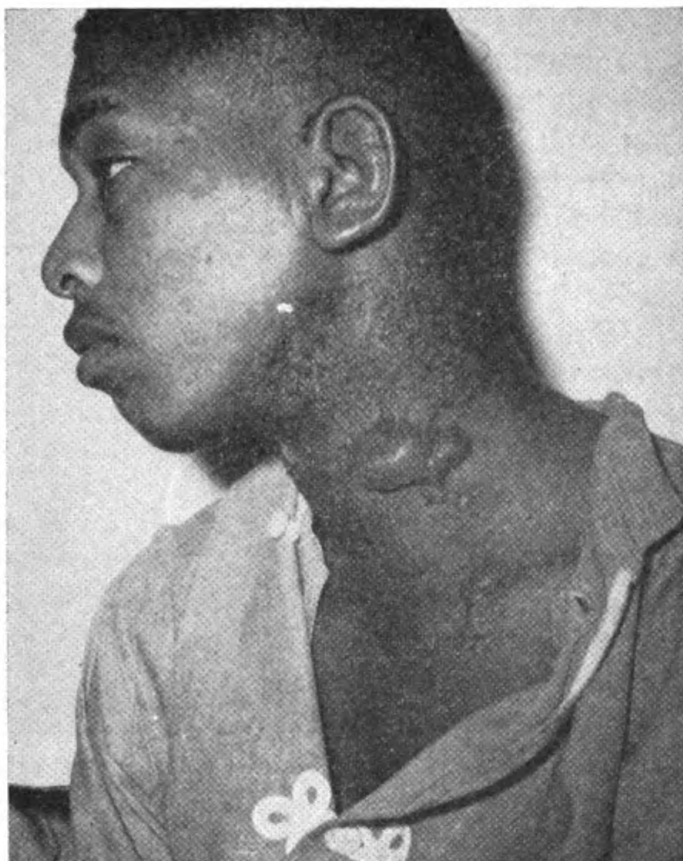


FIGURE 1a. Mustard burn twenty-four hours after exposure. Burn was treated by débridement and pressure dressing.

\*Arsenic trichloride is used in the manufacture of lewisite gas.



Within eight to twenty hours there was a doughnut-shaped vesicle filled with clear fluid, surrounded by a zone of erythema.

Speed is essential in first-aid treatment. At the scene of the accident, first aid administered within the first five minutes may prevent the burn entirely or reduce its degree and extent. The procedure in first aid is as follows: first, the clothing must be cut away or removed; then the excess mustard is blotted off with tissue; M-4 ointment\* is applied and washed off immediately; following this, a soap and water shower is taken, and M-4 ointment is reapplied; the shower is repeated, the patient wrapped in a blanket and removed to hospital on a stretcher (see table II). Only 6 percent of our cases which were admitted to the hospital had first-aid treatment. In every case where immediate first aid was employed, the burns were minimal and the length of the stay in the hospital was very short.

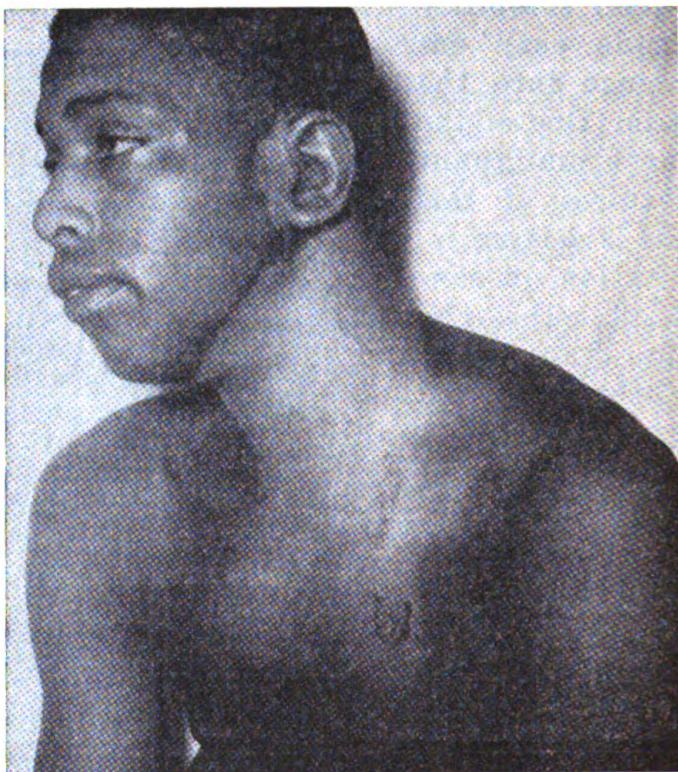


FIGURE 1b. Dressing was removed after seven days, with complete healing. Patient returned to work on the ninth day following burn. Note how burn had extended to involve a much larger area than shown in figure 1a.

Once the vesicant lesion was formed locally, definitive treatment included: (1) pressure dressing (figure 1); (2) sulfadiazine triethanolamine spray; (3) applications of various ointments; (4) amyl salicylate; (5) saline baths. In our experiences, we found the most successful form of management to be débridement and application of pressure dressings wherever possible.

\*Protective Ointment M-4, Chemical Warfare issue.

Débridement was delayed twelve to forty hours until vesicle formation was complete, the burned surface being wrapped loosely in a sterile towel during this time. The area was then completely débrided under aseptic technique, the raw surface sprinkled with sulfanilamide crystals and covered with one layer

TABLE II

Chemical agent	First-aid treatment of skin lesions
Mustard	<i>If widespread :</i> (1) Cut away or remove clothes. (2) Blot off excess mustard with tissue. (3) Apply M-4 ointment, mix well with mustard on skin, and completely wash off immediately. (4) Soap and water shower. (5) Dry and reapply M-4. Repeat shower. (6) Wrap in sheet or blanket and remove to hospital on stretcher.
	<i>If localized :</i> (1) Cut away or remove contaminated clothing. (2) Blot away any mustard on skin with cotton waste or cleaning tissues. (3) Rub M-4 ointment into the skin.
Lewisite	<i>If extensive :</i> (1) Pour 1 pint of peroxide inside clothing. Get under shower. (2) Cut or tear off clothing. (3) Swab area with peroxide. (4) Dry area and apply BAL ointment.* (5) Move on stretcher to hospital.
	<i>If localized :</i> (1) Cut or tear off clothing. (2) Blot with tissue or cotton waste. (3) Wash thoroughly with water. (4) Dry area and apply BAL ointment.
White phosphorus	(1) Immerse in water and apply copper sulfate solution (2%) to burned area.
Nitrogen mustard	(1) Treatment same as for mustard burns.
Arsenic trichloride	(1) Treatment same as for lewisite burns.

\*Item No. 91028, Medical Department Supply Catalog (to be published in change notice, about 1 February 1944, and to be available in March 1944).

of sterile gauze heavily impregnated with vaseline. Two layers of gauze dressing of 2- or 3-inch thickness were applied, followed by cotton waste and wrapped in 3-inch elastic bandage. The dressing was not disturbed for seven to eighteen days. This has proved to be our most successful form of management in deep mustard burns, resulting not only in a marked reduction in days in hospital, but also in the need for nursing care.

The use of amyl salicylate dressings in mustard burns has been advocated,<sup>2</sup> but, in our experience, this therapy entails frequent change of dressings and exposes the burned surface to the possibility of secondary infection. However, in mild mustard burns with small vesicles the aspiration of vesicle fluid and

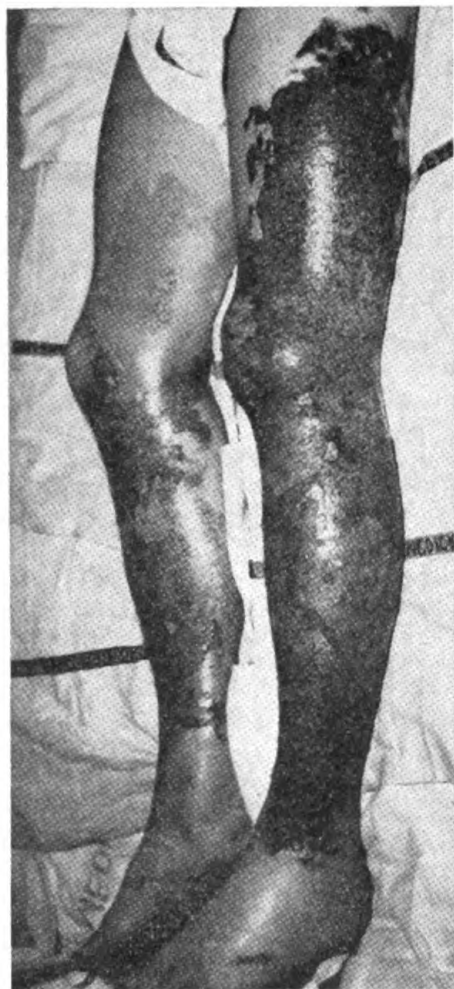


FIGURE 2a. Extensive lewisite burn twenty-four hours following burn.

application of amyl salicylate wet dressings were very effective. In areas involving the upper inner aspects of the legs, the scrotum, penis, and anal areas, puncturing of the vesicles, followed by saline baths or dressings, was the treatment of choice. In other areas where pressure dressings could not be applied, sulfadiazine triethanolamine spray every hour for twenty-four hours until a tanning was effected was the treatment employed.

**Lewisite**—Beta-chlorovinyl-dichlorarsine ( $\text{ClCH:CH.AsCl}_2$ ). Lewisite is a heavy, oily liquid with an odor resembling that of geraniums. It is a vesicant, as is mustard, with powerful penetrating properties, but it has an immediate irritant action in contradistinction to mustard. The products of hydrolysis and oxidation of lewisite burns are said to be highly toxic and their absorption may cause acute arsenical poisoning.<sup>3</sup> Erythema following exposure develops rapidly and vesication is usually

complete in twelve hours. The lewisite vesicle is well defined, overlies the entire erythemic area, and is filled with an opaque fluid, containing traces of arsenic.<sup>3</sup> (Goldman could not detect arsenic in vesicle fluid.)<sup>6</sup> As in mustard, the essence

6. Goldman, Leon: Some Medical Problems of Vesicant Chemical Warfare Agent as Affecting Civilian Populations, Bulletin of the New York Academy of Medicine, 19:57-72, Jan. 1943.



of first aid is speed, and consists of immediate removal of clothing, preferably under a shower, and the application of BAL ointment. The use of 8 percent hydrogen peroxide has been recommended in first-aid treatment.<sup>7</sup> In lewisite burns involving less than 5 percent of the body surface débridement and pressure dressing constitutes the method of choice. In extensive lewisite burns where there is danger of absorption of arsenic, it is our policy to débride all blisters on their appearance, and to treat the burn by saline dressings or saline baths, in order to lessen the danger of absorption.

*White phosphorus.* White phosphorus is a waxy solid, very active chemically, bursting into flame when combined with oxygen in the air. It is stored and handled entirely under water. However, employees are occasionally sprayed with flying particles of phosphorus which become embedded in the skin, causing deep burns. First-aid treatment is very important and consists of immediate immersion of the burned part in water, followed by the application of 1 to 3 percent copper sulfate solution which acts by converting the phosphorus element into an inert salt which will not ignite. The resulting burned area looks black (figure 3). The blackened particles are then removed by aseptic technique. Among white phosphorus burns, 2 have been treated with pressure dressings, 1 with sulfadiazine triethanolamine spray, and 2 with saline baths. The end results in all cases were equally good.

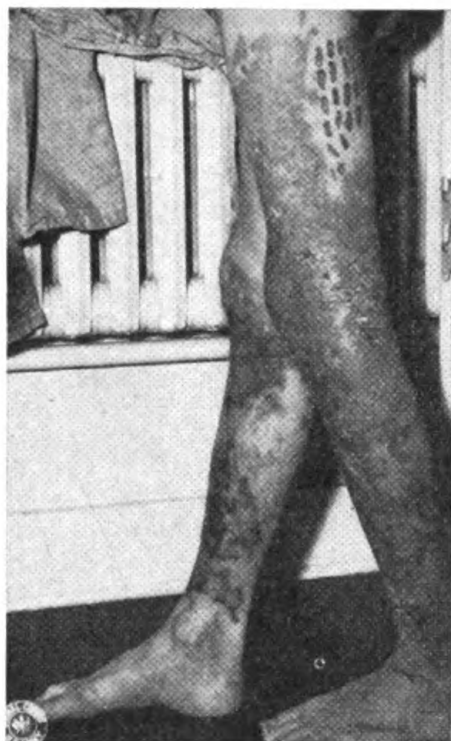


FIGURE 2b. Forty-two days after original burn, showing excellent healing and skin graft of left leg.

7. Treatment of Casualties from Chemical Agents, Technical Manual (TM 8-285), War Department. 27 Nov. 1942.



*Nitrogen mustard.* Nitrogen mustard<sup>8</sup> is vesicant, persistent, and odorless. Blisters may not appear until twenty-four hours after contamination. The first aid is the same as for mustard gas. We have had only two burns, one of which was treated by débridement and pressure dressing, and the other by sulfadiazine triethanolamine spray. Both methods provided satisfactory end results.

*Arsenic trichloride.* Arsenic trichloride is not a war gas, but an intermediary in the manufacture of lewisite. It is a colorless liquid and is poisonous. The first-aid treatment is the



FIGURE 3. Extensive white phosphorus burn of face, neck, left arm, right hand, chest, and abdomen.

same as for lewisite gas. We had two burns from arsenic trichloride. Both of these were treated by sulfadiazine triethanolamine spray, with excellent end results.

#### GENERAL TREATMENT

The general treatment of chemical burns is the same as for any other burn, namely, the treatment of shock, prevention of hemoconcentration and toxemia, maintenance of serum protein and electrolyte balance, prevention of secondary infection, and the treatment of anemia. To carry out this program a comprehensive plan of treatment, adaptable enough to include accepted and recognized therapeutic measures, was instituted (table III).<sup>9</sup> Cases 1 and 2 illustrate the practicability of such a plan.

CASE 1. W. G., white, male, age 33, sustained third degree burns of both lower extremities when he was sprayed with lewisite liquid. The burns involved about 20 to 25 percent of the body surface. The patient received adequate first aid at the scene of the accident. On arrival at the hospital the patient was cold, clammy, extremely nervous, and restless. The blood pressure was 124/80, the pulse, 76. Within two hours the blood pressure

8. Chemical Warfare Bulletin, p. 42, September 1943.

9. Practical Concept for the Treatment of Major and Minor Burns, Ann Surg., 116:641, November 1942.

was 90/60, and the pulse, 124, even though he had received 8 units of plasma. Hematocrit reading was 52 percent. The patient received 26 units of plasma within the following four days, which was sufficient to control hemoconcentration. Sufficient morphine was administered to control apprehension. Ten cc. of eschatin were given intravenously every four hours for six doses. Fluid intake was maintained between 4,000 and 6,000 cc. daily, and a high carbohydrate-protein diet was given. The local lesion was treated by saline compresses. Serum protein on the fifth day was 5.25 grams, and on the seventh day, 7.4 grams. The patient developed a rather severe anemia, under 3,000,000 red blood count, for about two weeks, with a hemoglobin of 52 to 58 percent by photoelectric method. Blood transfusions were administered on the 10th, 13th, and 16th day. Urine showed a positive Gutzeit test, but total arsenic excretion over a period of twenty-four hours was never over 0.35 milligrams. Patient was skin-grafted on 32d day.

CASE 2. J. A., white, male, age 27, sustained extensive second and third degree burns of the chest, abdomen, and face, and third degree burns of the neck and entire left arm when sprayed with phosphorus (figure 3). The burns involved about 35 to 40 percent of the body surface. Adequate first aid was administered at the scene of the accident. On entrance to the hospital, he was in shock, blood pressure 70/50, pulse imperceptible, hematocrit reading 68 percent. One-half grain of morphine was administered, and 18 units of plasma were given within the first three hours. The patient was placed under an oxygen tent. Four hours after admission the blood pressure was 126/80, and the pulse was of fair quality. Eschatin was given intravenously, 10 cc. every six hours. Sixteen hours following admission the blood pressure was 70/50, the pulse again imperceptible, and hematocrit reading was 68 percent. Twelve units of plasma were again administered, followed by intravenous glucose. The hematocrit reading following this was 46 percent, and the plasma proteins, 7.2. Sulfonamides were administered by mouth, 1 gram every four hours. The patient had a very stormy course. Transfusions were necessary to combat anemia. The patient is recovering, although at this writing he is still in hospital.

#### DISCUSSION

In searching for an adequate treatment of the local lesion of chemical burns, we found that aside from first-aid measures, methods were as varied as in the treatment of local lesions of thermal burns. Lewison advocates sulfadiazine triethanolamine spray;<sup>10</sup> Wakeley, gentian violet jelly or triple dye;<sup>11</sup> Goldman, sulfadiazine suspension, tannic acid-silver nitrate crusting, or wet compresses of diluted alum subacetate or permanganate, depending upon the size of the lesion;<sup>6</sup> amyl salicylate has been advocated.<sup>2</sup> We approached the problem with no set notions, but tried to evaluate each type of treatment, taking into consideration the ultimate result, the need

10. Lewison, Edward F.: Emergency Treatment of Chemical Warfare Casualties, Surg. Clin. N. America, 22:1435-1443, October 1942.

11. Wakeley, C. P. G.: The Treatment of War Burns, War Medicine (Pugh, ed.), pp. 41-57, 1942.

TABLE III  
*General management of chemical warfare burns*  
*Station hospital, Pine Bluff Arsenal, Arkansas*

Period of shock 48 hours			Toxemia 2d to 5th day	Granulation and infection 5th to 11th day	Healing 2d to 6th week
First hour	First 24 hours	Second 24 hours			
Hypo. morph. $\frac{1}{4}$ gr. Repeat as necessary.	Continue morphine as may be indi- cated.	Continue cortin or eschatin as needed.	Sedative MS or barbiturate as needed.	Same.	Same.
Serum or plasma in amounts up to 1,500 cc.	Cortin or eschatin as needed.	TAT 1,500 to 3,000 units.	Sulfonamides 1 gm. Q 4 hr.	Same (as indi- cated).	Same (as indi- cated).
Water — by mouth containing CHO for 24 hr.	Continue plasma to a minimum of 2,000 cc. for 10% burn in 48 hr.	Blood substitutes and/or IV saline or glucose as indi- cated by blood chemistry.		Transfusion—500 cc. Q 2 days, de- pending on red blood count.	Skin graft as soon as wound is clean.
Oxygen—oxygen mask or tent, if in- dicated.	Control saline or plasma by HGB hematocrit serum protein reading.	Fluids—as toler- ated.	Fluids—min. 3,000 cc.—mouth.	Same.	Fluids—2,000 cc.
Intravenous glucose or electrolyte solu- tion if needed.		Enema.	Diet—High prot. and CHO.	Same—vitamins as indicated. Cathartics as indicated.	Same.
			Enema Q 2 days.	Same.	Same.
Hemoglobin estima- tion or hematocrit or red blood count.	Repeat hemoglobin estimation or hematocrit or red blood count until hemoconcentration controlled and thereafter at least daily.	Blood chemistry Total prot. (alb. and glob.) Arsenic determina- tion in arsenic burns.  Urinalysis.	Blood chemistry N.P.N.  Arsenic det. in arsenic burns. Sulfonamide level. Blood counts and HGB as indicated. Urinalysis. Blood typing. Hematocrit.	Same.  Arsenic det. in arsenic burns. Sulfonamide level. Same. Urinalysis (one).	If indicated.  Arsenic det. in arsenic burns. Sulfonamide level. Blood counts and HGB. Urinalysis (weekly).

for nursing, the length of time for hospitalization, and the personnel which each type of treatment required. The average number of days patients were hospitalized with each type of treatment is summarized (chart 1). It is difficult actually to evaluate each method of treatment because the length of time of hospitalization depended on: (1) degree and extent of the burn; (2) part of body involved; (3) type of treatment; and (4) type of chemical burn. Lewisite burns apparently healed more quickly than mustard in every type of local treatment. This probably was due to the fact that the patients knew when they were first burned and received immediate first aid, while mustard burns were usually insidious. Ninety-four percent of mustard burns did not realize they had been contaminated until hours later. Those burns treated with ointments were first degree burns or minimal second degree burns, and probably any type of treatment would have been satisfactory, and hospitalization would have been short. Amyl salicylate was tried on a few deep mustard burns, but almost all of these developed secondary infection and had

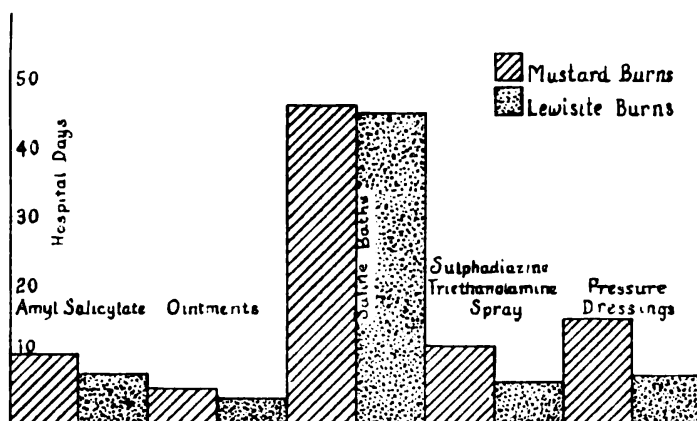


Chart 1. Illustrating Average Number of Days Hospitalization for Various Types of Local Treatment

to be treated with saline dressings. Burns requiring saline baths involved scrotal and anal areas, and healing was slow. We feel that, wherever applicable, pressure dressings are by far the method of choice in treatment of chemical burns. Figure 1 is a striking example of this. The mustard burn was extensive, involving not only both sides of the neck but also a portion of the anterior part of the chest and both ears. The patient was in hospital only eight days. This is an excellent result when one considers that even without superimposed infection, mustard burns may persist from six to eight weeks.<sup>11</sup> Pressure dressings entailed less nursing care than any other method. It is very important that before the pressure dressing is applied that all of the blisters are developed, else the patient will experience discomfort. In scrotal and anal areas where



pressure dressings could not be employed the number of days required for hospitalization was as high as forty-six days. In mild burns, especially involving the hands, we would agree<sup>2</sup> that amyl salicylate dressings appear to give excellent results. In first and second degree burns involving portions of the body where pressure dressings could not be applied, sulfadiazine triethanolamine spray seemed to be effective. Saline baths were used as treatment of burns involving scrotal and anal areas, and in the treatment of cases which had become infected. We have not used pressure dressings in extensive lewisite burns because there is danger of arsenic poisoning from absorption; however, we treated many less extensive cases of lewisite burns by pressure dressings with excellent results. So far we have had no manifestation of arsenic intoxication from lewisite burns, even though as much as 20 to 25 percent of the body surface was involved.

We feel strongly concerning the importance of the general treatment of chemical warfare burns. We cannot agree with the statements of Goldman<sup>6</sup> that, "It is unusual to find any marked systemic reactions early in the course of even severe vesicant casualties," or, "Unlike extensive burns of the skin, the patients with vesicant gas burns do not show anhydremia."<sup>12</sup> The general management of chemical warfare burns is as important as the general treatment of thermal burns.

#### SUMMARY

1. A definite plan, adaptable enough to include accepted methods of therapy, will prove invaluable in chemical warfare burns.

2. Pressure dressings, wherever applicable, are the method of choice in the local treatment of deep burns. The one exception is extensive lewisite burns.

3. Chemical burns involving the scrotum and anal areas and upper inner aspects of the legs respond well to saline baths. In other areas where pressure dressing cannot be applied, sulfadiazine spray is the treatment of choice.

4. Amyl salicylate dressings are excellent in mild mustard burns which do not involve the face or scrotal areas.

5. Extensive lewisite burns should have all blisters excised on their appearance, and the burned area should be treated locally by saline baths or dressings.

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12. Goldman, Leon, and Cullen, Glenn G. E.: Vesicant Chemical Warfare Agents, Arch. Derm. Syph., Chic., 42:123-136, July 1940.

# Sporotrichosis in Horses

## Case Report

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and

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Sporotrichosis in horses is relatively rare and is not easily differentiated from other more serious infections which have similar clinical characteristics. Ulcerative lymphangitis, the skin form of glanders (farcy), and epizootic lymphangitis are important conditions which may closely resemble sporotrichosis. A similar, if not identical, disease affects man. The human form was recognized in the United States in 1898 by Schenck,<sup>1</sup> whose findings were extended in 1900 by Hektoen and Perkins,<sup>2</sup> and have since been amply confirmed. In 1910, Page, Frothingham, and Paige described sporotrichosis in horses.<sup>3</sup> These authors pointed out the resemblance of human and equine sporotrichosis and differentiated the latter from epizootic lymphangitis of horses. The disease has been reported also in dogs, but details are lacking.<sup>4 5</sup> Several new reports have recently appeared on sporotrichosis in man.<sup>6 7</sup>

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Major Wayne D. Shipley, Veterinary Corps, and Captain Carl R. Vaupel, Veterinary Corps, had charge of the clinical management of the case presented. Colonel James E. Ash, Medical Corps, Curator of the Army Medical Museum, provided the photomicrographs and Lieutenant Colonel Balduin Lucke, Medical Corps, assisted in preparing the manuscript.

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2. Hektoen, L., and Perkins, C. F.: Refractory Subcutaneous Abscesses Caused by *Sporothrix schenckii*. A New Pathogenic Fungus, J. Exp. M., 5:77, 1900.

4. Page, C. G., Frothingham, L., and Paige, J. B.: *Sporothrix* and Epizootic Lymphangitis, J. Med. Res., 18:137, 1910.

4. Kelser, Raymond A., and Schoening, H. W.: Manual of Veterinary Bacteriology, p. 432. Baltimore: Williams and Wilkins Company, 1943.

5. Hagen, W. A.: The Infectious Disease of Domestic Animals, pp. 378-380. Ithaca, New York: Comstock Publishing Company, 1943.

6. Owens, D. V., Falk, A. B., Otsuka, M.: Sporotrichosis, Arch. Derm. Syph., 45:788, April 1942.

7. Welsse, Elwood C.: The Prevalence of Sporotrichosis in Connecticut. A Review of Three Cases and the Report of a New Case, Connecticut Med. J., 6:841, November 1942.

## CASE REPORT

Horse Y365, a chestnut gelding of riding type, 8 years of age, was purchased on 26 November 1940 at Chicago, Illinois, and then shipped to the Front Royal Remount Depot. On 1 October 1941, this horse was admitted to the veterinary station hospital with numerous small subcutaneous "abscesses" on the anterior and inner surfaces of the left forearm. The abscesses were treated by local application of antiseptics, and the horse was released from the hospital. The lesions apparently produced little discomfort, and the general condition of the animal was excellent. On 21 March 1942, when the horse was

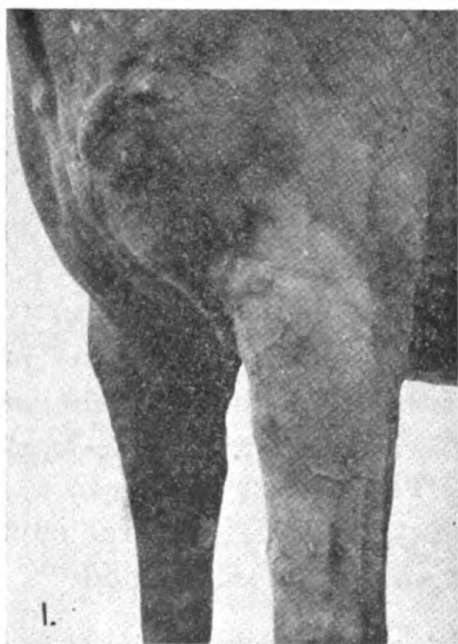


FIGURE 1. Subcutaneous nodules on lateral aspect of left forearm and breast.



FIGURE 2. Medical aspect of left forearm and breast. Some nodules on the forearm have ulcerated; those on the breast are unbroken.

readmitted to the hospital, numerous subcutaneous nodules were observed on the anterior and inner surfaces of the left forearm and on the breast and left shoulder; the lesions were similar in appearance and location to those seen in October. Material was now removed by biopsy for cultures and sections. Since the condition did not respond to medical treatment, most of the nodules were removed surgically on 11 June 1942; the remaining visible lesions were removed on 1 July 1942. The wounds healed rapidly and the horse was turned out to pasture. On 15 April 1943, the animal was again admitted. The

lesions at this time were similar to those seen on the previous occasions; they were again removed surgically on 21 April 1943 and treatment with potassium iodide by mouth was initiated. On 25 June 1943 the horse was returned to pasture. Two months later, the lesions had not returned.

#### MORPHOLOGY

The subcutaneous lesions consisted of nodules along the course of the larger lymph vessels. The nodules were raised above the surface of the skin, and varied in size from 1 to 5 centimeters in diameter. Most of the smaller lesions were solid

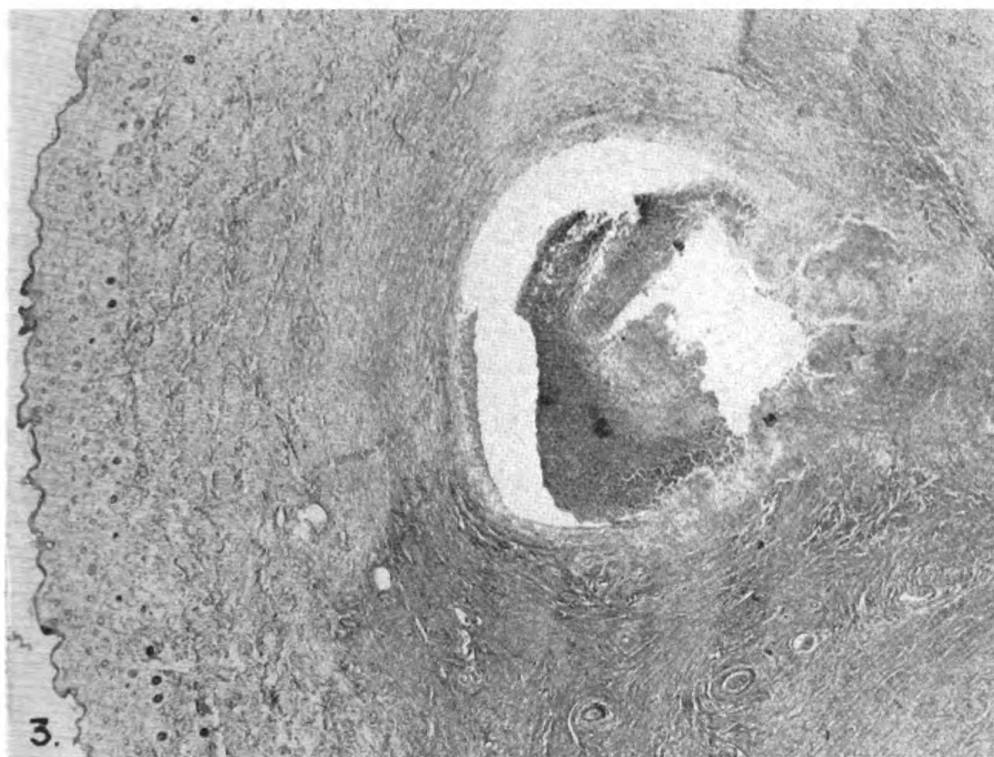


FIGURE 3. Sporotrichosis. Low power view of a section through a nodule. The "abscess" is in the center of the lesion and is surrounded by a thick capsule. Intact epidermis is shown covering the nodule. (Army Medical Museum Negative 74603.X-10)

throughout, and of uniform greyish color; the larger lesions contained a purulent core; several had ruptured, leaving a crateriform ulcer. Cross section of excised large nonruptured nodules showed a dense rim of scar tissue surrounding thick yellowish pus. The latter was of uniform, smooth consistency and did not contain granules. There was no tendency of the nodules to coalesce, but they appeared to be connected by lymphatics, which were not conspicuously thickened.



Microscopically the large nodules consisted of a central mass of debris and necrotic leukocytes, surrounded by a zone of highly vascular granulation tissue with numerous lymphocytes and monocytes, and scattered giant cells (figures 3 and 4). Few polymorphonuclear leukocytes were present. Toward the periphery of the lesion the tissue was dense and fibrous, with much intercellular collagen and small scattered foci of mononuclear cells. In smaller nodules, the central foci of nec-

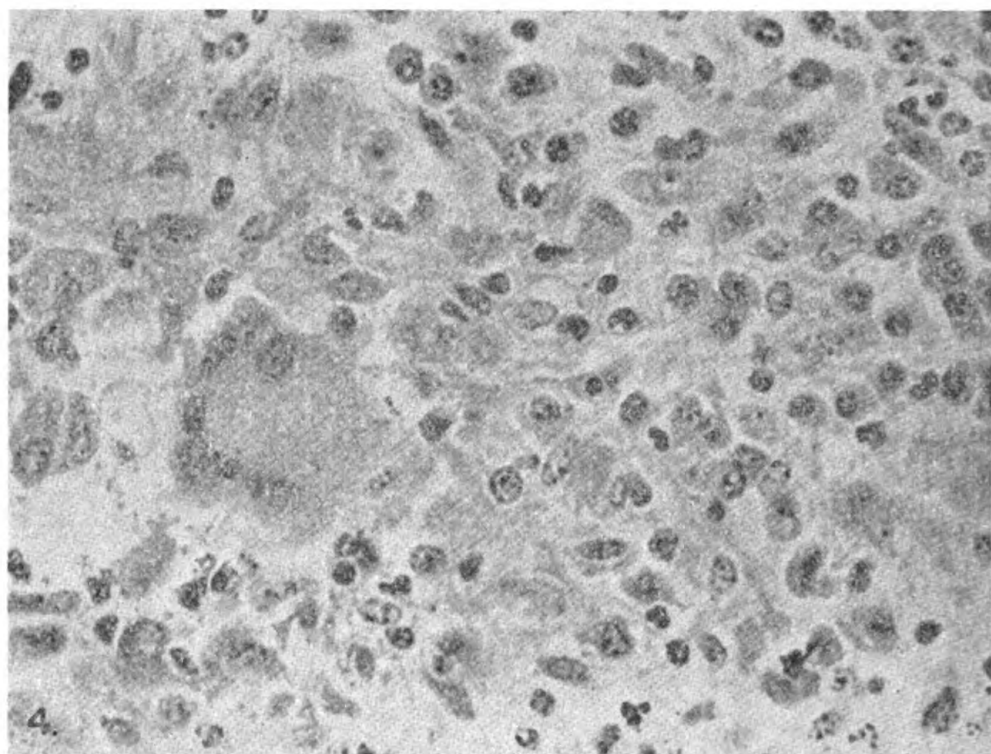


FIGURE 4. Sporotrichosis. Granulation tissue in the inner part of the wall of an "abscess." Note the syncytial giant cells, fibroblasts, numerous monocytes and lymphocytes, and paucity of polymorphonuclear leukocytes. (Army Medical Museum Negative 75702-X-765)

rosis were usually absent; otherwise, their cellular composition was similar to that described.

Some difficulty was encountered in demonstrating the organism. Smears of pus stained with Giemsa's stain revealed a few gram-positive ovoid or coccoid bodies. We were unable to demonstrate the organism with certainty in tissue sections of equine material. In contrast, in the sections of experimentally infected laboratory animals the organisms were readily seen.

## BACTERIOLOGY

Smears of the purulent material from the horse revealed a few gram-positive ovoid or coccoid bodies (conidia) that stained with difficulty. In smears made from cultures on maltose agar the organisms had a typical mould-like appearance, with branched filamentous aerial hyphae, and conidia, or spores, on some of the short branches (figure 8). In smears from lesions of experimental animals, filamentous hyphae were not observed, conidia being the only structures seen (figure 7). The conidia usually appeared as ovoid bodies about 1 micron wide and 2.5 to 5.0 microns long; spherical forms were also encountered. In brief, the organisms appear principally as conidia in lesions and as branched filaments in cultures.

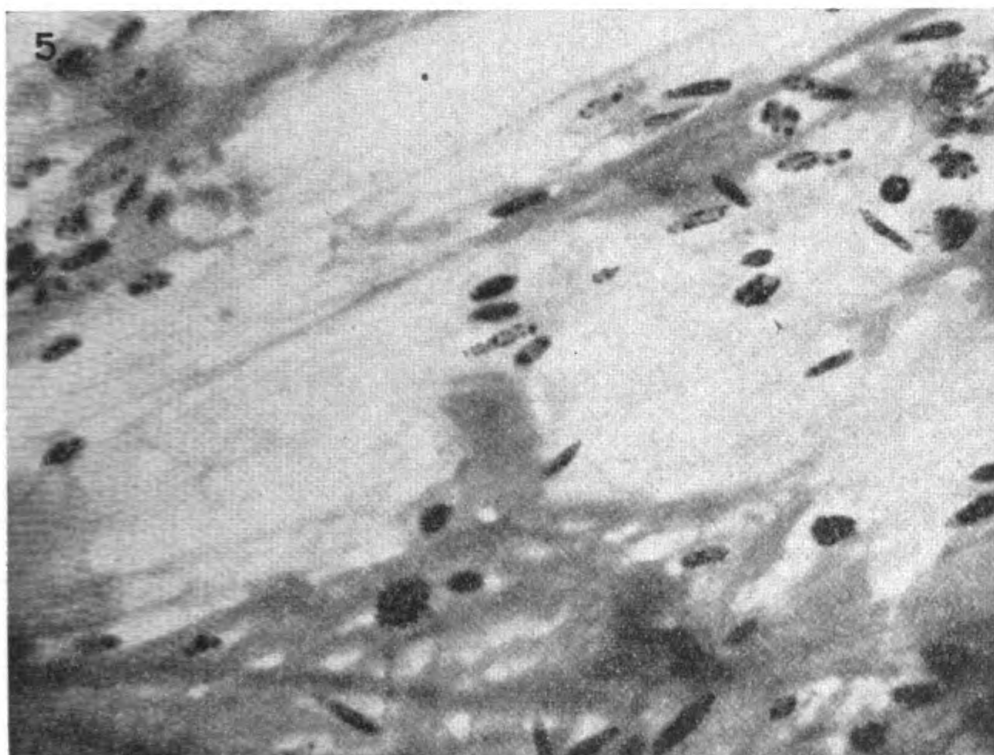


FIGURE 5. *Sporotrichum schencki*. Smear of peritoneum of experimentally infected mouse. Cigar-shaped and ovoid conidia may be seen. Gram's stain. (Army Medical Museum Negative 74605-X-2320)

## CULTURAL CHARACTERISTICS

The organisms grew best under aerobic conditions at room temperature (25° C.). Media containing maltose were most favorable for cultivation. On maltose agar the organism grew luxuriantly. Smooth, flat, grayish white colonies, 2 to 3 mm., in diameter, appeared during the first twenty-four to thirty-six hours and usually covered the surface of the slant within

four or five days. Later the growth became rough, dull, and darker in color. By the tenth day the edges had acquired brownish color, due to the development of spores. Within three weeks the entire surface turned black from still more abundant spore formation. After thirteen weeks at room temperature, the organism could still be successfully transplanted.

On plain nutrient agar, growth was much less luxuriant. Colonies were first seen after forty-eight to seventy-two hours; they were 1 to 2 mm. in diameter, grayish white in color, with raised centers, and roughened borders. Similar growth occurred on blood agar slants.

In thioglycollate (anaerobic) media, growth occurred after twenty-four hours within the upper 1 cm. of the media and remained confined to this aerobic layer, spreading over the surface in approximately four days. After this time the cultures continued to grow slowly in the aerobic zone.

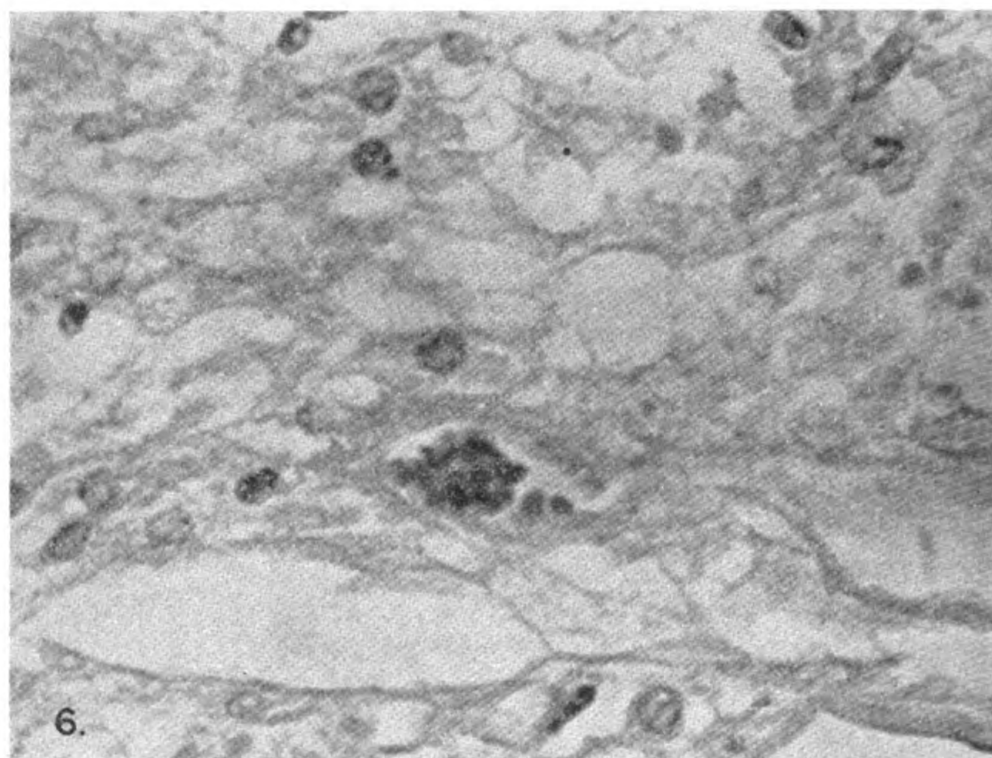


FIGURE 6. Sporotrichosis. Section of testicle of experimentally infected hamster showing granulation tissue and a few monocytes. Compare with figure 7. H and E stain. (Army Medical Museum Negative 74710-X-1000)

In broth, the organism grew characteristically, depending upon the type of enrichment. In maltose broth growth was approximately twice as rapid as in other liquid media. Within twenty-four hours a few tiny colonies were visible; they rapidly increased in number and gradually settled to the bottom, leaving the supernatant medium clear. These colonies had the appearance of tiny tufts of cotton with compact centers. When disturbed, they remained discrete. By the sixth day, delicate pellicle formation started on the surface; a thick pellicle was usually present by the eleventh day.

In blood broth, serum broth, and glycerin-serum broth, growth was quite similar. Colonies developing in each of these media were usually larger but less numerous than those in maltose broth. No pellicle formed up to thirty days; the entire growth settled to the bottom of the tube except for a few colonies which were adherent to the sides. A few of these adherent colonies grew above the surface of the media, often for as much as 2 cm.; they usually were stellate in shape and resembled flakes of frost. This peculiarity of growth was not observed in any of the other media.

In broth containing sucrose, dulcitol, raffinose, manitol, and lactose, small stellate colonies appeared in twenty-four hours. By the fourth day they settled to the bottom of the tube, forming a sediment 0.5 to 1 cm. deep. After eleven days a pellicle started to develop. No acid or gas was formed in any of these sugar media. Each gradually increased in alkalinity, the phenol red indicator becoming deep red by the sixteenth day. On the thirtieth day the pH of the cultures usually was 7.8.

In dextrose broth, the organism grew much the same as in the other sugar media except that small amounts of acid were produced. The phenol red indicator gradually turned orange-yellow in color. After thirty days, this media had a pH of 6.3.

No growth occurred in 6.5 percent sodium chloride solution.

#### PATHOGENICITY

Suspensions of pure cultures of the organism isolated from horse Y365 were injected intraperitoneally into mice, rats, hamsters, rabbits, and guinea pigs. In addition, a horse was inoculated intradermally and subcutaneously. The results of the inoculations were as follows:

On 24 April 1943, six young mice were inoculated. Two remained well, but four mice died—on the 38th, 40th, 40th, and 63d day, respectively. At autopsy, white fibrous nodules were seen in the subcutaneous tissues, especially on the tail and legs, peritoneum, pleura, and omentum. The visceral lesions frequently gave rise to adhesions. Occasionally, similar nodules were found within the liver. The experimental lesions differed from those seen in the horse in that they consisted entirely of young granulation tissue, heavily infiltrated with mononuclear cells. The organisms were demonstrated without difficulty. Smears of pus stained by various methods revealed conidia in large numbers (figure 5). In tissue sections they were also readily demonstrated with MacCallum's stain.<sup>8</sup>

Of six mice inoculated on 4 June 1942 with peritoneal washings from one of the preceding, four died—on the 5th, 11th, 41st, and 41st day, respectively. From all, typical organisms were recovered in pure culture. Two mice, destroyed on the 78th day, showed no lesions.

8. Mallory, F. B.: *Pathological Technique*, p. 374. Philadelphia: W. B. Saunders Co., 1938.

Five young male rats were inoculated with a culture of the organism in maltose broth. After forty days, all five appeared well and were sacrificed. At autopsy, several yellow nodules, 3.0 to 6.0 mm. in diameter, were found in the tunica vaginalis of one rat. From these the organism was recovered in pure culture. Another rat had two similar but smaller nodules in the tunica vaginalis and three in the omentum. No gross lesions were found in the other three rats.

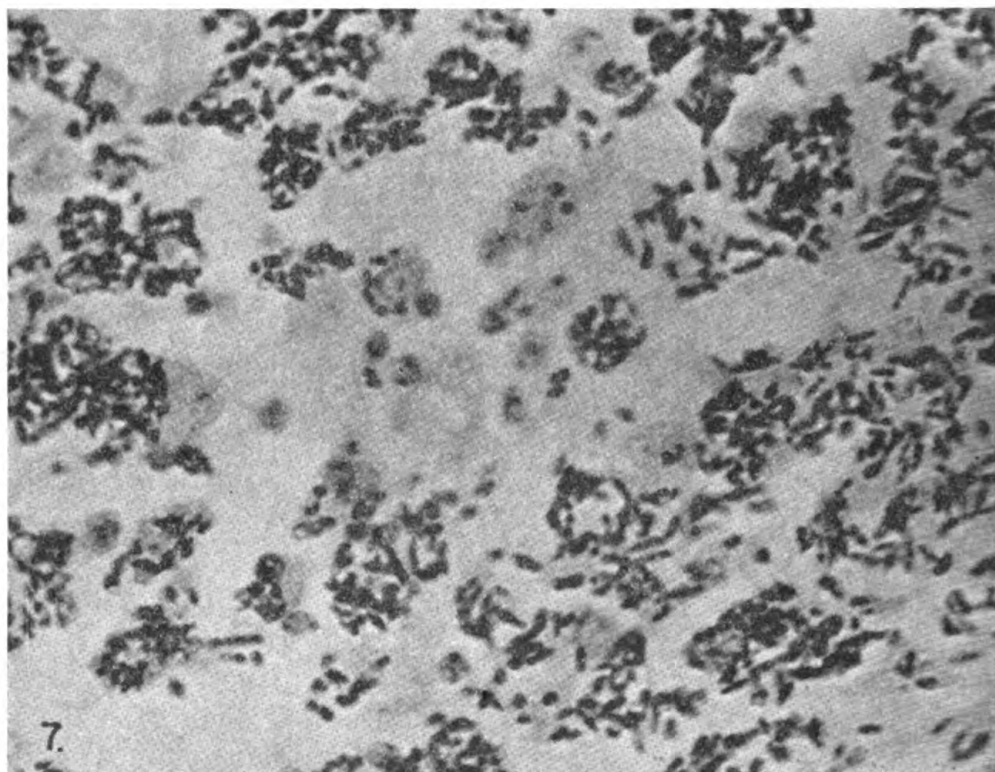


FIGURE 7. *Sporotrichum schencki*. Photomicrograph of same field as that shown in figure 6. This section was stained by McCallum's method. Note that the organisms are distinctly pleomorphic. (Army Medical Museum Negative 75713-X-1000)

On 31, July 1942, five young male hamsters and five young male rats were inoculated with 0.2 cc. of a suspension of the organism grown on maltose agar. Thirty-two days later one hamster was destroyed in extremis. At autopsy, lesions similar to those observed in mice were seen. In addition, the scrotum was distended with a large purulent and granulomatous mass. The organisms, present in large numbers in this material, were demonstrated in tissue sections (figures 6 and 7) and isolated in pure culture. The other four hamsters died—on the 34th, 36th,



39th, and 39th day following inoculation. Similar lesions were found and the organism was isolated from each animal. The lesions in the rats, inoculated to compare susceptibility, were much less extensive.

The inoculation of hamsters was repeated, using a group of ten young males. All developed typical severe orchitis and died. From these experiments it may be concluded that the male hamster is most susceptible to infection with this strain of *Sporotrichum schencki*.

Horse (a two-year-old colt) : All the growth on one ten-day maltose agar slant was suspended in 2 cc. of normal saline solution and 0.5 cc. of this suspension was injected subcutaneously

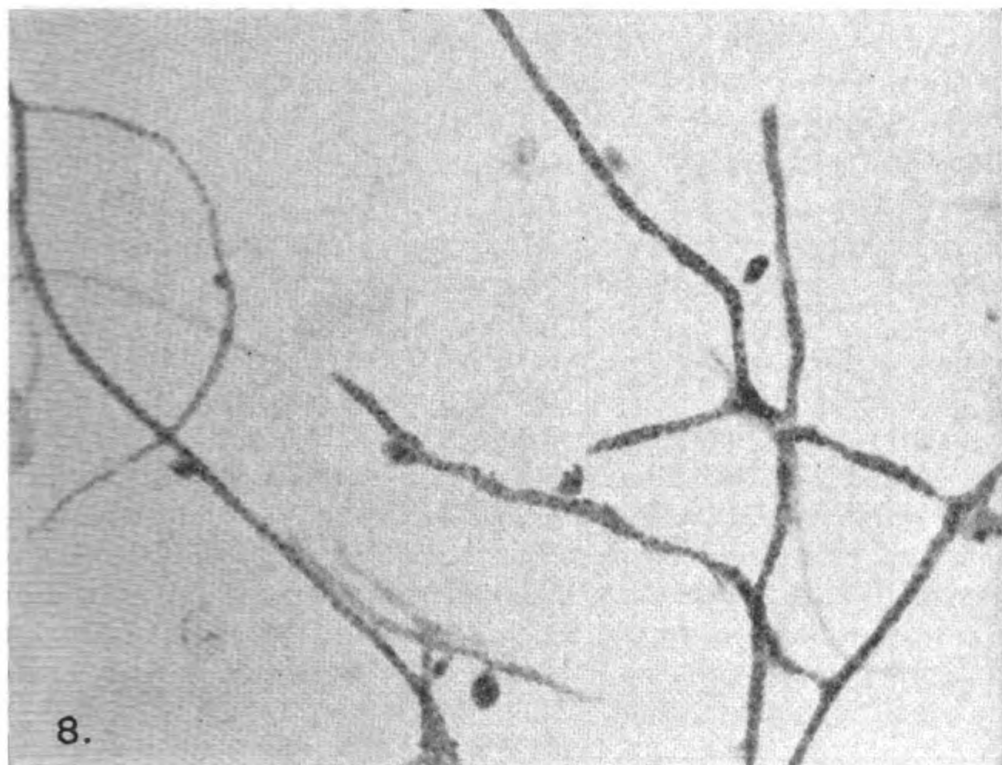


FIGURE 8. *Sporotrichum schencki*. Smear of maltose agar culture stained by Gram's method. Branched filaments and a few conidia are shown. (Army Medical Museum Negative 74605-X-2320)

in the left forearm and in the upper third of the left arm of a colt, two years of age. An equal amount was injected intradermally in the arm. Nodules developed at each of these inoculation sites. One nodule on the arm ruptured after ten days and discharged yellowish creamy pus. *Sporotrichum schencki* was isolated in pure culture from this material. The lesions did not spread greatly and eventually disappeared spontaneously.

TABLE I  
*Chronic lymphangitis of horses*  
*Differential diagnosis*

Disease	Caused by	Clinical	Bacteriological	Animal inoculations
Sporotrichosis	Sporotrichum secheniki (beurmanni)	Nodules or heavy walled abscesses along course of lymph channels; no tendency for nodules to coalesce; they occasionally ulcerate. Lymph nodes usually not involved. Mallein test and complement fixation test for glanders negative.	Culture of pus at room temperature on maltose agar: Characteristic mould-like growth, conidia on branching filaments.	Produces characteristics lesions in hamsters, rats, mice. Organism may be isolated in pure culture from testicle, and demonstrated in tissue sections (MacCallum's stain).
Farcy (Skin-form of glanders)	Malleomyces mallei	Obstinate lymphangitis. Formation of ulcers common. Lymph nodes frequently involved. Intradermal mallein test usually positive. Complement-fixation test positive.	Culture organism on media containing glycerol. Incubate at +37° C. Gram-negative coccoid organism or filaments 0.3 to 0.5 to 0.7 to 5.0 microns.	Guinea pigs develop acute peritonitis or orchitis from intraperitoneal inoculation. (Straus' reaction). Organisms may be isolated from testicle.
Epizootic lymphangitis	Cryptococcus farciminosus	Lymph vessels enlarged ("corded") with nodules along them. Break common. Mallein test and complement - fixation test for glanders negative.	Yeast-like organism in smears of pus. Doubly contoured oval cells 3 to 4 microns by 2.5 to 3.5 microns. No mycelia formed in lesions or cultures. Growth on ordinary media very slow if at all.	Guinea pigs occasionally develop abscess of regional lymph nodes following inoculation. Rabbits may develop abscess at inoculation site.
Ulcerative lymphangitis	Corynebacterium pseudotuberculosis	Ulcers usually around fetlock resemble farcy, but heal more readily. Lymph nodes rarely involved. Mallein test and complement fixation test for glanders negative.	Gram-positive diphtheroid organism grows slowly on most media. Characteristic colonies.	May produce Straus' reaction in guinea pigs. Pathogenic for sheep, cattle, goats, horses, dogs and rabbits, but not for fowl.

Two rabbits and five guinea pigs were inoculated but proved refractory to infection.

#### DISCUSSION

The present military use of horses and mules in tropical countries where equine skin infections are common makes the differential diagnosis of sporotrichosis a matter of importance. As was indicated above, sporotrichosis may be closely resembled by farcy, epizootic lymphangitis, and ulcerative lymphangitis. Although these diseases are under control in the United States, they are serious problems in many other countries. For the accurate differentiation of these several diseases laboratory examination is essential; table I is presented as a guide.

#### SUMMARY

In a case of equine sporotrichosis, the lesions consisted of subcutaneous nodules, variable in size, some firm, and others ulcerated; they were situated along the course of the larger lymphatics of the chest and of one of the forearms. Microscopically, the nodules were composed of granulation tissue, with numerous monocytes, lymphocytes, and giant cells; polymorphonuclear leukocytes were rare. In these lesions the organisms were not readily demonstrable.

*Sporotrichum schencki* was isolated and its cultural characteristics studied. It grew best on media containing maltose.

The pathogenicity of the sporotrichum was tested with mice, rats, hamsters, a horse, guinea pigs, and rabbits. Of these animals, the latter two species were found to be refractory to infection. The other species proved susceptible, with the male hamster the most susceptible. A severe orchitis was invariably produced in this animal by intraperitoneal inoculation. In contrast to the scarcity of the organisms in the lesions from the horse, they were numerous and easily demonstrable in the lesions of the experimentally infected laboratory animals.

The differentiation of sportrichosis from epizootic lymphangitis, farcy, and ulcerative lymphangitis is discussed.

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**Fear and Mystery.**—Any new weapon is credited in advance with being more dangerous and deadly than a familiar one. Thus the German experts advocated to the rebels a simple ruse for crossing one of the Ebro tributaries. On a windy day the latter spread from their side clouds of strange-colored smoke. This mysterious event was followed by the flight of our soldiers, who did not realize that they were being tricked, but suspected that a new and terrible poison gas was being employed.—Mira, Emilio: *Psychiatry in War*. New York: W. W. Norton Co., 1943.



# Treatment of Skin Infections in the Assam-Burma Jungle

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Medical Corps, Army of the United States

A medical officer newly arrived in the Assam-Burma region on his own in the jungle, equipped with an armamentarium that reflects more creditably on American technology and salesmanship than on practicability, is likely to be confused. Much of his work will be the treatment of minor wounds and infected skin lesions. I have written this paper to show with what simple equipment such lesions can effectively be handled and to warn of procedures which are dangerous. My experience is based on two years of surgical work in this theater and on the observation of thousands of cases.

Ointment with a greasy base should never be used on infected skin lesions in this area. I refer to the common, mildly antiseptic boric acid and zinc oxide ointments, which prevent normal drying of skin surrounding the lesion and encourage maceration of cornified epithelium by sweat and thus provide a fertile medium for the spread of the infection. I believe that dry dressings are suitable only for clean wounds and that infected wounds on skin lesions must be treated with wet dressings. Tiny abrasions do not require a dressing. The best treatment is thorough cleansing with soap and water followed by a mild antiseptic. Dressings become wet with sweat or mud, or, if perchance they remain dry, they are soon wrenched off, carrying with them the fibrin coagulums, leaving wounds with thrombosed capillaries.

## FRESH WOUNDS

Traumatic wounds in the jungle generally are fairly clean. It is important, however, to clean the wound and surrounding skin with soap and water, using a stiff brush. The wound should then be painted with an antiseptic such as tincture of mercurochrome or picric acid. Tincture of iodine cannot be used, because of the danger of skin burn if a dressing is to be applied. When the wound is not extremely superficial and thus merits a dressing, sulfanilamide powder is thoroughly rubbed into it with

a sterile scalpel handle and a little sulfanilamide powder is applied to a sterile gauze dressing held over the wound by strips of adhesive tape. A liberal amount of roller bandage is applied over this dressing. The superficial roller bandage dressing may then be changed when soiled without disturbing the wound. When necessary to remove the entire dressing, one should cut the gauze away where it is adherent to the wound.

Leech and insect bites should never be dressed, merely kept clean. Rarely is it necessary to apply a dry sterile dressing to a leech bite that refuses to stop bleeding. Leech bites itch for days. It is well that patients' hands be kept clean, particularly at night, and nails trimmed short. Bites are the most common causes of cellulitis, lymphadenitis, and tropical ulcer.

#### MINOR SKIN INFECTIONS

The treatment of such lesions is divided into two distinct stages: (1) convert the lesion into a clean wound and (2) keep the wound clean until healed. The continuous wet dressing method is by far the most successful method of cleaning up infection. When clean, firm, dry granulation tissue finally appears, the first stage of treatment is concluded. Complete and rapid healing will now occur if a dry sterile dressing is applied. Sometimes it is desirable to dust the raw surface with sulfanilamide powder before applying the dressing. Frequent change of dressing is undesirable but when a change is necessary it should be accomplished without pulling off any adherent crusts. If pus is encountered, a day or two of the wet dressing regimen probably will suffice to render the lesion permanently clean. In my experience, the best agent for a wet dressing is magnesium sulfate solution, and the most practical way to use it is as a 50 percent solution in pure glycerin. A liberal dressing of sterile gauze is soaked in the glycerin solution and applied to the cleansed wound. If a still more liberal dressing is desired, a sheet of surgical cotton is applied over the gauze and bound firmly with roller bandage. In large or badly infected wounds it is well to wet the superficial dressing with a sterile 50 percent water solution of magnesium sulfate. A small amount of ethyl alcohol, sprinkled over the dressing first, will allow the magnesium sulfate solution to soak into the dressing more rapidly.

An extensive superficial infection covering arms and legs, and often face and neck, is not frequently encountered but is hard to cure. The early lesions are typical of dermatitis venenata; however, infected blebs and pustules rapidly obliterate dis-

tinctive features. To clean up the infection requires hospitalization. A cotton dressing continuously wet with saturated solution of boric acid is best for face and neck lesions. Gauze dressings continuously wet with a 50 percent aqueous solution of magnesium sulfate is preferred for lesions of the extremities. When the infection is controlled, wet dressings are discontinued. The skin is washed with boric acid solution, dried, and a two-layer thick gauze dressing soaked in the following mixture applied and covered by thin sheets of surgical cotton and roller bandage:

Bismuth subcarbonate	4 oz.
Sulfanilamide powder	1 oz.
Cod liver oil	6 oz.

#### MAJOR SKIN INFECTIONS

In these jungles major cutaneous infections are either large infected wounds or, more commonly, Naga sores (tropical ulcer). The treatment of infected treatment of infected wounds resembles that for

minor skin infections except patients should be hospitalized. After infection has cleared, secondary closure of the wound with silkworm gut may be necessary.

#### TROPICAL ULCER (NAGA SORE)\*

The Naga sore, the most serious skin infection, is common during the monsoon. Naga sores are seen most frequent-

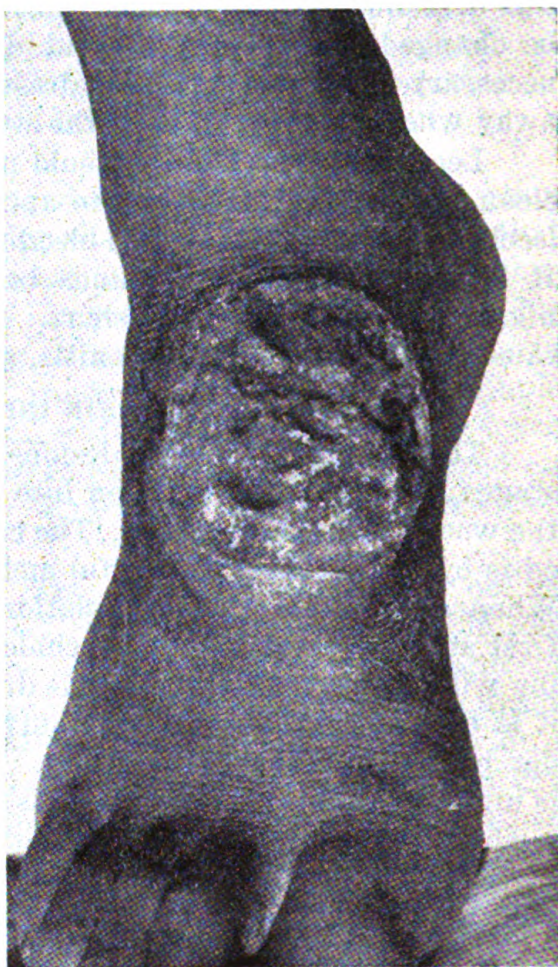


FIGURE 1. Tropical ulcer. Photograph by Museum and Medical Arts Service.

\*Editorial note.—Tropical ulcer prevails in India, Southern China, the Philippines, Indo-China, the Solomon Islands, New Guinea, Malaya, and throughout Melanesia, and is common in most parts of Africa and tropical South America. According to Stitt's book on Diagnosis, Prevention, and Treatment of Tropical Diseases, 6th Ed., Vol. 2, Lloyd Patterson described an outbreak in Assam which swept like a plague up the whole of the country. Tropical ulcer is often named after the regions in which it is especially prevalent; hence, Naga sore in Assam, Mozambique ulcer, Yemen ulcer, etc. Clinically, a differential diagnosis has to be made between the ulceration of yaws, syphilis, amebic ulceration of the skin, oriental sore, varicose ulcers, and desert sore.

ly in patients with systemic disease, especially chronic malaria, but I do not believe there is any direct connection between the two diseases. A conspicuous group of systemic diseases in which the incidence of Naga sore is high is the nutritional disease group, including chronic dysentery. A nutritional disease to which I believe Naga sore is related is beriberi, a disease seen in malnutrition and chronic dysentery; almost invariably there are at least minimal signs of beriberi. Supporting this contention is the fact that brewer's yeast or thiamin chloride help in healing Naga sores, the knowledge that beriberi and Naga sore went hand-in-hand among Allied troops that I saw after they escaped from Burma in the 1942 monsoon season, and the common knowledge that beriberi and Naga sore appear together with the monsoon and disappear to a marked extent when the monsoon ends.

#### PATHOLOGY OF NAGA SORE

Smears made from the most active part of the ulcer, the undermined edge, show a predominance of fusiform spirochetes identical with Vincent's organism. Other workers have been able to reproduce the lesion experimentally by introducing Vincent's organism anaerobically into skin lacerations. Usually the lesion begins as a minute abrasion, friction blister, or insect bite, most commonly a leech bite. The earliest lesion is a yellow superficial bleb filled with puriform exudate. At the center of the skin underlying the bleb usually is a minute puncture hole. The lesion is "queer looking" and very painful for its size.

Transition from the early acute to the acute fulminating lesion occurs in two or three days. The acute fulminating lesion is an extremely painful ulcer. The crater is filled with grey-white, semiliquid, glairy material. The base of the crater shows little or no granulation tissue, is poorly defined, and consists of necrotic tissue mixed with shreds of fibrous and elastic tissue overlaying a deeper base of nonviable fascia. At this stage there is a blue-grey border of undermined necrotic and partly liquefied skin. The border is not raised during the fulminating stage. Inflammation is absent. The signs of local resistance are minimal, as though the necrotizing process had proceeded faster than inflammatory barriers could be set up. The exudate in the crater resembles autolyzed tissue. The odor is putrid and strong.

The acute fulminating lesion with deep tissue involvement is occasionally seen. Excruciating pain accompanies this lesion



and the mortality may be high. Fascia may appear to act as a barrier to the spread of the lesion. However, muscle planes beneath fascia that has been exposed are usually nonviable in these cases. If the periosteum is exposed, the underlying bone will later form a sequestrum. The lesion may even resemble gas gangrene, for the superficial ulcer gives no indication of the distance up and down muscle planes to which the necrotic process has spread. Maggots, which frequently accompany such extension lesions, may be discovered not only under the skin edge but in necrotic muscle at remote distances.

The chronic lesion differs much from the acute fulminating lesion. It is not very painful. The distinguishing features at this stage are the inflammatory signs. The lesion may still progress slowly, checked as it were by the inflammatory, raised, indurated, red, but not undermined border. The bed of the ulcer has irregular, friable granulations in the center of which frequently is a black dot. The base of the ulcer is covered by a copious purulent exudate.

#### TREATMENT OF NAGA SORES

- Systemic disease, such as malaria and dysentery, should be treated simultaneously with the ulcer. It is most important to give cases of dysentery both specific and supportive treatment to avoid loss of foodstuffs and vitamins. Edema of the feet or other manifestations of beriberi call for large amounts of thiamin chloride; attention to these matters will reduce mortality.

The early acute lesion, after the necrotic blister has been trimmed away and the surface cleansed, is treated as a minor skin infection; that is, magnesium sulfate-glycerin dressings are applied and changed daily until the lesion is clean. Further dressings usually are not necessary.

Treatment of the acute fulminating lesion entails hospitalization and preliminary minor surgical procedure. An anesthetic should be avoided if beriberi is present. The overhanging skin edge is excised. All necrotic tissue of the ulcer base must be cut or scraped away gently with a sharp knife. If maggots are encountered and it is feared that all have not been removed the wound should be packed with gauze soaked in azochloramid in triacetin for one day. Azochloramid seems superior to magnesium sulfate-glycerin in this one respect. The most important thing is the dressing which prevents flies from laying eggs on the wound. Among unsophisticated troops and natives the whole art depends on applying a dressing that cannot be removed by

the patient. After excision of necrotic tissue, a large gauze sponge soaked in magnesium sulfate is applied to the wound, covered by surgical cotton, and held firmly in place by roller bandage. Soaking the entire dressing with 50 percent magnesium sulfate solution helps; the dressing should be changed daily.

The acute fulminating lesion with deep tissue involvement requires a more extensive operation. Spinal or general anesthesia, the latter a risk that must often be accepted when beriberi is present, is necessary. The lesion and surrounding skin must be scrubbed vigorously with soap and water. The cleaned area is painted with tincture of mercurochrome or picric acid, the field is draped and a surgical sponge folded to fit the ulcer. With one hand holding this sponge, the skin edge and crater of the ulcer are excised with a sharp scalpel. Any contaminated instruments or drapes now are replaced and gloves changed or at least washed in bichloride solution. Exposed fascia is then excised and all nonviable muscle or connective tissue removed. Tendons and large nerves need not be excised. Exposed periosteum should be excised and underlying bone saucerized. An attempt should be made to leave the entire surgical wound saucerized. It is often necessary to extend incisions up and down the extremity in order to remove necrotic muscle.

Finally, sulfanilamide powder or crystals are rubbed into all surgically exposed tissues and all the wounds packed open with vaseline gauze. A large gauze dressing with perhaps a gram of iodoform powder in the superficial layers to make the odor less offensive is applied. After wrapping the entire limb in a layer of cotton a plaster of paris cast is applied. The cast should extend to the tip of the extremity and beyond the first proximal joint. The first change of cast is made in three weeks and subsequent change at about the same interval. At these changes the base of the wound invariably will appear composed of clean, firm granulation tissue. If bone is involved in the lesion, the subsequent treatment is that of osteomyelitis. When the crater has filled with healthy granulation tissue the cast need not be reapplied. A few days of wet dressings will then render the lesion clean enough for pinch grafts of skin.

The chronic lesion is a less difficult problem. Sometimes magnesium sulfate-glycerin dressings are sufficient. Generally it is best to trim the edge of the lesion with a sharp scalpel and

curette the edge and base with a sharp curette under anesthesia. Sometimes it is sufficient to cauterize the edge and base with phenol or copper sulfate. In my experience, this is the only time when cautery may be used in treating Naga sore. Magnesium sulfate-glycerin dressings are applied to the cauterized or curetted wound. If, however, the lesion is exposed to excessive trauma, as when the ulcer is on the shin or internal malleolus or if excessive use of the extremity appears to delay healing, the vaseline gauze, sulfanilamide powder, plaster cast procedure should be adopted. When the cast is removed in three weeks the lesion frequently is healed.

#### CONCLUSION

I should like to emphasize that skin wounds may be cared for under adverse jungle conditions with a maximum of efficiency and with excellent results. The mortality even in the worst cases can be almost zero.

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## Diphtheria Among German Prisoners of War

**CAPTAIN STEPHEN FLECK**

Medical Corps, Army of the United States

**CAPTAIN JOHN W. KELLAM**

Medical Corps, Army of the United States

and

**MAJOR ARTHUR J. KLIPPEN**

Medical Corps, Army of the United States

The recent literature on diphtheria is noteworthy for two definite trends: an increasing incidence of the disease in adults, and a clinical course not generally considered characteristic. These important considerations are discussed here in relation to an outbreak of diphtheria among German prisoners of war.

The outbreak occurred at the U. S. Army Internment Camp at Aliceville, Alabama, which received several thousand German prisoners during the summer of 1943. These men had been captured during the North African campaign and, after imprisonment there, had been transported to Aliceville, Alabama, without interim bivouac. Sanitary conditions in the camp were good when inspected in early September. The prisoners were housed in barracks of standard type, fifty men

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The hospital registrar, Lieut. George L. Runyon, and the laboratory staff, Misses Norma Klippen, Helen Klippen, Laura Downer, and Sergeant C. W. Terry rendered assistance.

to the building. Each enclosure contains about one thousand men and there was almost no contact between inmates of different enclosures. The general health of the prisoners was fair; they were very susceptible to skin infections and were infested with a variety of tropical diseases.

In the second week of July, admissions for respiratory diseases began to increase, reaching a peak during the first week in August. A second peak occurring two weeks later may be considered artificial, because an active search for diphtheria cases followed the first diagnosis of diphtheria on 23 August. (figure 1). Diphtheria had not been diagnosed previously be-

cause the clinical picture of the throat cases was that of follicular tonsillitis. At that time one patient died after a five-day illness which began as "tonsillitis" followed by "bronchopneumonia," despite intensive therapy including tracheotomy. While macroscopic and microscopic autopsy findings were indicative of diphtheria, it was not possible to confirm the diagnosis bacteriologi-

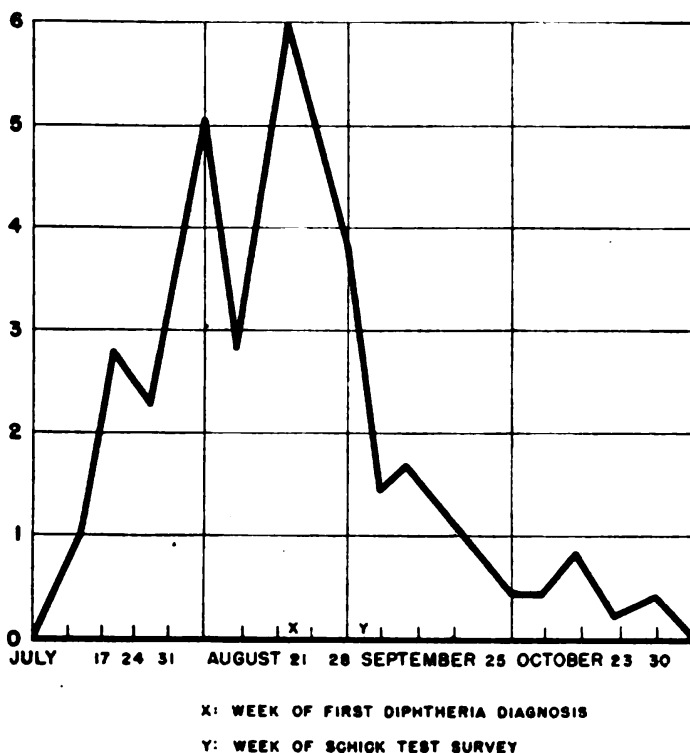


FIGURE 1. Hospital admissions per 1,000 men per week for all respiratory diseases, July through October 1943.

cally. Subsequently, until the end of October, 48 cases of pharyngeal diphtheria were diagnosed, 4 cases of diphtheritic wound infection, 1 case of diphtheritic myocarditis, and 6 cases of postdiphtheritic paralysis, which had not previously been known to have had pharyngeal diphtheria. The highest number of weekly diphtheria admissions (11 cases), during the first week of September, did not coincide with the peak in the over-all respiratory disease rate in August. The explana-



tion—the failure to diagnose diphtheria during July and August—is borne out by the ratio of ambulatory patients with sore throats to those hospitalized. Despite increased vigilance and cultures of all pathologic throats seen during September and October, this ratio rose from 2.5:1 in August to 3.6:1 in September and to 4.1:1 in October.

TABLE I  
*Schick test survey in September 1943*

	Number tested	Number positive	Percentage positive
Prisoner enclosure A	912	220	24.1
Enclosure B	917	214	23.1
Enclosure C	950	156	16.4
Enclosure D	944	290	30.7
Enclosure E	926	77	8.3
Enclosure F	622	27	4.3
Prisoners of war total	5,271	984	18.7
American personnel	1,029	274	25.4

From 5 to 14 September, Schick test and carrier surveys for all prisoners were done under the auspices of the Fourth Service Command Laboratory. The results of these studies are shown in tables I and II. All individuals with positive Schick tests received toxoid and were Schick tested again for subsequent doses of toxoid if indicated.\* While the percentage

TABLE II  
*Carrier survey among prisoners of war*

Number tested	Schick	Number positive cultures	Percentage positive cultures
1,733	Neg.	82	4.7
168	Pos.	8	4.8

of susceptible prisoners ranged from 4.3 to 30.7 for the various enclosures, the distribution of hospitalized patients was fairly even throughout the entire compound. The lowest incidence of susceptibility was found in the two enclosures with the most recent arrivals—4.3 percent and 8.3 percent. Two cases occurred in hospital personnel, one in a German physician who had refused a second dose of toxoid. Virulence studies at the Fourth Service Command Laboratory showed pathogenic *C. diphtheriae* in 33 of 38 cultures taken from patients, and in 8 to 10 cultures taken from carriers. Further

\*Detailed analysis of these findings and of the immunization procedure employed will be reported separately.

bacteriologic studies disclosed that both carriers and patients were infected with the mitis type of *C. diphtheriae*, which was also indicated by the essential clinical feature of the epidemic.<sup>1 2</sup>

#### EXPLANATION FOR THE OUTBREAK

A plausible explanation for the outbreak of diphtheria in a group with a comparatively small number of susceptible individuals lies in the following considerations:

(a) The Schick test survey probably was carried out about two months after the first patients contracted diphtheria, without having been so diagnosed, and, also, after the epidemic had reached its second peak. Two case abstracts illustrate this point. The patients had been hospitalized in June and July respectively and were discharged with a final diagnosis of follicular tonsillitis. Both returned during September because of generalized paralysis of the postdiphtheritic type. It may be assumed that a number of the prisoners had become immune, either without contracting the disease or by having recovered from diphtheria which had not been recognized during the two or three months preceding the survey.

(b) In this survey the Schick tests were read in forty-eight hours by at least four observers. The short time interval and the large number of different interpreters tend to increase the number of false negatives. Eight patients were proved to have diphtheria, although their Schick tests had been read as negative. Diphtheria immunization had not been routine in the German Army, although some prisoners believed they had been immunized. However, reports of diphtheria in persons previously immunized and even in Schick-negative individuals have been frequent in recent years.<sup>3 4 5 6</sup> Six cases of repeated attacks of diphtheria in the same individual were also reported last year.<sup>7</sup> The minimum amount of

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1. McLeod, J. W.: The Types Mitis, Intermedius, and Gravis of *C. diphtheriae*, Review of Observations During Past Ten Years, *Bact. Rev.*, 7:1, Mar. 1943.

2. Wright, H. D.: Diphtheria in Liverpool During Years 1937-40, *J. Path. Bact., Lond.*, 52:283, May 1941.

3. Neubauer, C.: Clinical Signs of Diphtheria in Inoculated Children, *Lancet* II: 192, 1943.

4. Phair, J. J.: Diphtheria Immunization; Interpretation of Schick Test. *Am. J. Hyg.*, 36:283, Nov. 1942.

5. Amlin, K. M.: Diphtheria Problem in Waimea District, Hawaii M. J., 1:367, July 1942.

6. Murphy, J. N., Jr., Cook, E. B., and Bohls, S. W.: Clinical Cases of Diphtheria Occurring in Patients Who Had Previously Received One Injection of Alum Precipitated Diphtheria Toxoid, *Canad. Pub. Health J.*, 31:276, June 1940.

7. Grant, J.: Diphtheria; Some Recent Observations on Susceptibility, *Med. Off., Lond.*, 68:149, 7 Nov. 1942.

circulating antitoxin indicated by a negative Schick test is usually given as 0.004 units. Whatever the correct figure may be there seems to be agreement that a negative Schick test, particularly in adults, is not an absolute indication of diphtheria immunity, errors running as high as 5 to 8 percent.<sup>4 8 9</sup>

These remarks do not question the validity of the Schick test or of active immunization; however, the diagnosis of diphtheria, when indicated clinically should be considered despite a history of prophylaxis or of a negative Schick test, no matter how recent.<sup>6 10</sup>

#### PROBABLE SOURCE OF EPIDEMIC

Diphtheria was not present in American personnel in this camp during the same period, although 25 percent of them were Schick-positive (table I). This percentage compares favorably with other adult surveys in the United States<sup>10 11</sup> and Canada.<sup>8</sup> Both prisoners and guardians obtained food, including milk and water, from the same sources. Endemic diphtheria probably was imported by the Germans themselves from Africa. One patient with postdiphtheritic paralysis stated that he had a severe sore throat aboard ship while en route to the United States. Other prisoners who arrived late in September had been immunized in African prison compounds because of diphtheria there. No case of diphtheria had occurred in this latter group as of 31 October 1943. Diphtheria has been reported from other internment camps in this country,<sup>12</sup> and endemic diphtheria is said to have prevailed throughout the German-Russian war theater. Diphtheria rates from various European countries<sup>13</sup> have been reported higher than United States figures during the last decade.<sup>14</sup> These data indicate that the epidemic did not originate in Alabama and also make it seem likely that our own troops will be exposed to diphtheria during this war. Diphtheria of epidemic proportions has been reported in recent years from Northern

8. Cameron, G. D. W.: Schick Test in Adults, *Canad. Pub. Health J.*, 32:412, Aug. 1941.

9. Zinsser, Hans, and Bayne-Jones, S.: *A Text Book of Bacteriology*, pp. 427. New York: D. Appleton-Century Co., 1939.

10. Schuman, L. M., and Doull, J. A.: Diphtheria Infection and Morbidity in Cleveland, 1937-1939, *Am. J. Pub. Health (supp.)*, 30:16-24, March 1940.

11. Levy, A. J.: Susceptibility of Adult Population to Diphtheria, *Illinois M. J.*, 82:390, Nov. 1942.

12. Blumgart, Lieut. Col. Herman L.: Personal communication.

13. Slater, Paul R.: Medical and Sanitary Data on Yugoslavia, *Army M. Bull.*, 66:137, 1943.

14. Diphtheria Mortality in Large Cities of the United States, *Annual Reports*, *J. A. M. A.*, 114:1875, 1940; and *J. A. M. A.*, 119:1503, 1942.

Palestine,<sup>15</sup> Great Britain,<sup>2</sup> Canada,<sup>16 17</sup> the Netherlands,<sup>18</sup> the Hawaiian Islands,<sup>5</sup> and Nova Scotia.<sup>19</sup> Most of these reports emphasized that many cases occurred in adults. Besides likely exposure of our armed forces, a definite epidemic potential may exist among our adults who never have been immunized or whose immunization has lapsed. The difficulty of immunizing adult is well known. Overcrowded defense industry areas would seem to present a field for diphtheria prophylaxis among adults.<sup>11 20</sup>

#### CLINICAL OBSERVATIONS

The clinical aspects of 51 consecutive records of diphtheria patients admitted during September and October 1943 were studied. This period included the largest number of diphtheria admissions per week, but probably fell into the downward grade of the epidemic curve as indicated by the over-all respiratory disease admission rate (figure 1). During the second half of this period, toxic patients with typical membrane formation and concurrent cranial nerve paralysis were seen for the first time. Before October, the only clinical indications of a virulent organism were one fatal case and patients with paralysis, none of whom had received antitoxin. With these exceptions, the appearance of most of the throat cases was entirely compatible with a clinical diagnosis of follicular tonsillitis. An epidemic sore throat with a superimposed *C. diphtheriae* carrier status was considered but could not be upheld in the face of the bacteriologic findings and the evolution of the epidemic in October in a truly virulent and typical form, despite a low morbidity.

#### PHARYNGEAL DIPHTHERIA

There were 42 cases of pharyngeal diphtheria. Sore throat was universal among them and 23 had pain on swallowing. Thirty of these patients had temperatures of 101°F. or higher orally on the day of admission, but none of them had regurgitation of fluids prior to hospital entry. Thirty-two

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15. Cameron, J. D. S.: Outbreak of Diphtheria—Northern Palestine, 1940-41, *Edinburgh M. J.*, 50:1, Jan. 1943.

16. Simms, A. R.: Combined Outbreak of Septic Sore Throat and Diphtheria, *Canad. Pub. Health J.*, 34:152, 1943.

17. Tice, J. W.: Immunization Measures in the Royal Canadian Air Force, *Canad. M. Ass. J.*, 48:543, 1943.

18. Van den Belt, J. A. F.: Report of Subcommittee on Health and Medical Care to the Council of U.N.R.R.A. at Atlantic City, New Jersey, November 1943.

19. Campbell, P. S.: Outbreak of Diphtheria in Nova Scotia, *Med. Off., Lond.*, 68:45, 8 Aug. 1942.

20. Morton, A. R.: Health Problems in National Defence Areas, *Canad. Pub. Health J.*, 34:51, Feb. 1943.

patients had white blood cell counts of 10,000, or higher, with an average of 72.5 percent neutrophils. The leukocyte counts ranged from 6,200 to 27,100. Thirty-five records in this series contained detailed description of the throat pathology as seen on admission (table III). Less than one-third

TABLE III  
*Appearance of throat in 35 patients*

Character of tonsillar and faucial exudate	Number of cases	Percentage
Unilateral spotty	5	14
Unilateral membranous	2	6
Unilateral spotty with contact bleeding	1	3
Unilateral membranous with contact bleeding	5	14
Bilateral spotty	15	43
Bilateral membranous	2	6
Bilateral spotty with contact bleeding	3	8
Bilateral membranous with contact bleeding	2	6
Total membranous	(11)	(32)
Grand total	35	100

of the diseased throats were suggestive of diphtheria, while more than one-half the lesions were those of follicular tonsillitis. Similar findings have been reported of late from other sources.<sup>21 22</sup> Neubauer<sup>3</sup> in Liverpool, who noted the frequency of the "follicular tonsillitis type" of diphtheria, stated that only one-fifth of his patients showed sufficient exudate to cover both tonsils. It is noteworthy that 7 of the 11 patients with membranous exudate were admitted during October. A foul odor was noted in only 6 patients and never was pronounced. Three patients showed unilateral edema involving the fauces, uvula, soft palate, and neck tissues, giving the appearance of a tonsillar abscess. Lymph node enlargement and tenderness occurred in 31 patients. Paralysis of the ninth and tenth cranial nerves, within the first two weeks of the illness, was observed in 6 patients. Three of these had fairly typical membranous exudates and had contracted the disease during the last month of the outbreak. Also during this phase occurred the only 2 cases with lymph node enlargement of the "bull neck type."

21. Anonymous: A Lesson from Recent Diphtheria Deaths, Q. Bull. City of New York Dept. Health, 11:18, 1943.

22. Charbonneau, J. H.: Errors to Avoid in Diagnosis and Therapy of Diphtheria, Union med. Canada, 70:617, 1941.

## ANTITOXIN

All patients received diphtheria antitoxin intramuscularly into the buttocks on admission if diphtheria was suspected or as soon as a positive culture report was returned. Four patients developed serum sickness, manifested by urticaria, mild angioneurotic edema and mild arthralgia. Before receiving antitoxin all patients were tested intradermally for horse serum sensitivity, and one patient had to be desensitized. He was given 10,000 units in this manner without any subsequent reaction.

## CHEMOTHERAPY

Thirty-three patients received sulfathiazole or sulfadiazine in the usual dosage in an attempt to learn whether or not the quick recovery and mild course of the cases during the early part of the epidemic could be attributed to chemotherapy. Before the first diagnosis of diphtheria had been established in August, all tonsillitis patents had been given sulfonamides, among them, undoubtedly, a number of diphtheritics. Nine patients with diphtheria did not receive any sulfonamide, but responded to treatment as satisfactorily as did the larger group which received both antitoxin and chemotherapy. The average length of morbidity in uncomplicated cases differed by only one day in the two groups: 18.5 days for patients treated with both, chemotherapeutics and antitoxin, and 17.5 days for patients who had received only the latter. It may be worth while to administer sulfonamides as well as antitoxin to diphtheria suspects, so that time is not lost in case bacteriologic studies disclose streptococcal disease or Vincent's angina.

Patients with edema of the pharyngeal and lymphoid tissues received local heat in the form of poultices and infra-red light which effected good results within twenty-four hours in every case.

## CARRIERS

Patients were considered carriers if throat cultures remained positive for more than three weeks after otherwise satisfactory clinical course and therapeutic response. All carriers had badly hypertrophied and infected tonsils, which was true of a great number of the prisoners in general. In this series, only one patient had a previous tonsillectomy.

## CUTANEOUS DIPHTHERIA

Four patients suffered from "tropical ulcers," or "Veldt's sores," which was common among the prisoners. These ulcers with a gray dirty base usually developed at the site of some minor trauma. They showed mixed organisms, were slow in granulation and healing, and sometimes had to be grafted. While the occurrence of diphtheria bacilli in these ulcers was probably incidental, 3 patients had fever and leukocytosis, and 1 had myocarditis and transient paresis of the extremities. This latter case had not received antitoxin, as had the others. The serum did not influence the local lesions.<sup>23</sup> Local lesions responded most satisfactorily to sulfathiazole ointments, the basis probably being control of secondary invaders.

## COMPLICATIONS

The most important sequela was myocarditis of which there were 7 cases, one the aftermath of cutaneous diphtheria. Only 3 of the cardiac patients had characteristic membranous throat lesions. Except for the patient with cutaneous diphtheria, all had received at least 10,000 units of antitoxin and one as much as 48,000 units. It so happened that all of them also had sulfonamides. Five of the patients began showing tachycardia during their second week of illness. Belated and possible permanent damage to the myocardium is brought out by a case history, otherwise not connected with this series. This nineteen-year-old German soldier had diphtheria on the Russian front in August 1942. He apparently was treated adequately but had to be rehospitalized because of palpitation and substernal distress. He later developed postdiphtheritic paralysis. He was inactive for nine months. In May 1943 he went to Africa. He was captured and sent to Aliceville where he had to be hospitalized because of precordial pain and palpitation on exertion. Examination disclosed slight cardiac enlargement but no evidence of valvular disease.

No case diagnosed as diphtheritic myocarditis showed signs of valvular pathology, but 8 other patients—out of a total of 51—presented evidence of mitral disease on physical examination.

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23. Pasricha, C. L., and Panja, G.: Diphtheritic Ulcers of Skin; "Garigha" of Chittagong Hill Tracts, Ind. J. M. Res., 27:643, Jan. 1940.



## PARALYSIS

Postdiphtheritic paralysis occurred in five patients. One was in the group of pharyngeal diphtheria and had received antitoxin. Four patients had not been previously diagnosed as diphtheria but gave a definite history of sore throat six to eight weeks before the onset of neurologic symptoms. Two of these and the patient who had been diagnosed correctly had chemotherapy. Neurologically, the histories of all five patients were uniform and typical, beginning with eye complaints one month to six weeks after the original illness followed in sequence by dysphagia and regurgitation of fluids, paresthesia in fingers and toes, and finally, muscular weakness, most pronounced in the lower extremities. In no case was there involvement of the respiratory muscles. The patients were treated with parenteral vitamin B complex, massage, and graded exercise and their improvement was satisfactory.

## SUMMARY

1. Diphtheria cases occurred during a two-months period without being recognized.

2. Less than one-third of the patients properly diagnosed presented typical membranous throat lesions. The cases here reported fell into the declining, but more virulent phase of the outbreak.

3. Sulfathiazole and sulfadiazine proved ineffective against diphtheritic throat lesions or toxemia.

4. The epidemic may be considered the aftermath of diphtheria endemicity encountered by German troops in various parts of Europe and the Middle East.

5. The high degree of diphtheria susceptibility in our adult population, as well as an increasing incidence of the disease in adults should be given due consideration by public health officials and medical authorities of the armed forces.

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Erratum

In the article Traumatic Vasospasm, on page 25 of the February issue, in the legend of Fig. 1, the word *Supine* should read *Prone*, to correspond with the text.

# Opportunities for Treatment of Neuropsychiatric Patients

LIEUT. COLONEL WILLIAM C. MENNINGER

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The Medical Corps has as its mission "the conservation of manpower—the preservation of the strength of the military forces. This is accomplished by the selection and enrollment for military service, through properly conducted physical examinations, of only those men physically fit for the performance of the duties to devolve upon them, by keeping such personnel in good physical condition through the application of modern principles of preventive medicine, and in furnishing those who do become disabled with such aid in the form of evacuation and hospitalization facilities as will speedily restore them to health and fighting efficiency."<sup>1</sup>

There have been numerous directives concerned with the physical and mental standards for admission. Directives are in effect which set forth the necessity for rapid separation from the service of those men with defects who were mistakenly passed at their induction examination, of those who develop incapacitating physical or mental disorders after their admission to the Army, and of combat casualties. Unfortunately, there is a large number of neuropsychiatric patients in each of these groups, a percentage of which is recognized as being unfit for military service, even with unlimited treatment. The expeditious discharge of these men from the Army is in order and constitutes an important portion of the psychiatrist's job.

The discharge from the Army of men who cannot make fighting soldiers has led to some misconceptions. First, certain elements of the civilian public have been critical, on the assumption that the man broke down in the Army and therefore it is the Army's responsibility to cure him or else take care of him. They are ignorant of the fact that the great majority of these men presented evidences of their difficulty long

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1. Army Regulations 40-5, section I, paragraph 2, 15 January 1926.

before joining the Army. Furthermore, they lose sight of the chief function of the Army—to fight the war.

But there is also, at least a tendency toward, a misconception on the part of some medical officers in the Army. Because a man is not capable of being a fighting soldier does not mean he cannot be a very useful individual elsewhere in the war effort. He is not necessarily “lost” to the cause because he does not fit in the armed forces. Our Commander-in-Chief has indicated the fallacy of our thinking in terms of two fronts. The facts suggest that our manpower shortage may become most acute on our production line. Consequently, every attempt, either in or out of the Army, to rehabilitate men is directly in line with our total war effort.

Correctly, the average Army psychiatrist in our fixed hospitals regards the rapid disposition of his patients as of paramount importance, and the shortage of psychiatrists makes this function one of his most time-consuming jobs. At best, it takes from a week to six weeks to discharge patients from our neuropsychiatric wards. The pressure of the routine work of administration and examination may preclude consideration of therapeutic efforts among these patients, and too often they vegetate during that period of time. When left to their own spontaneous evolution, the majority of the acutely psychotic patients improve somewhat and the great host of psychoneurotic patients usually get worse. The so-called “nonpersonal” factors of early hospitalization, the avoidance of static situations, and other points well made by Porter, Novak, and Lemkau<sup>2</sup> are in themselves not adequate treatment. Nor is the addition of a thirty-minute assignment each morning to “police the ward” of any real therapeutic value, although too often this is the total “treatment” program.

In many of our hospitals, the mild and even the severe psychoneurotic patients are scattered through the general medical and surgical wards. In too many instances, once organic disease is excluded, the patient is either sent back for another trial at duty or, more frequently, no effort is made to give him psychotherapeutic or other help, and he marks time until his discharge papers are completed.

Regardless of the nature of his illness or his eventual disposition, every soldier should have the benefit of all possible therapy. Individualized prolonged psychotherapy is obviously

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2. Porter, W. C., Novak, J. G., and Lemkau, P. V.: Therapeutic Considerations for Army Psychiatrists, *Mil. Surgeon*, 92:372, April 1943.

impossible because of lack of psychiatrists. At best, only a few hours can be spent with one patient, and then it is only justified if the man can be salvaged for his immediate job—the Army. But every man is entitled to receive all benefits that the limitations of the situation do permit. The fact that rapid disposition is accomplished is no argument that reconstructive efforts should not be started. A physician does not withhold treatment efforts for malaria just because he can have the patient under his care for only three days. Our physical set-up in the Army is something of a handicap to therapy for neuropsychiatric cases, but in many hospitals this has been largely surmounted by special construction or rearrangement of available space and material. Personnel problems impose a limitation on any treatment program on the neuropsychiatric wards. Rarely have the personnel had any training or experience in psychiatry, but this can be met, in part at least, by organized teaching lectures and clinics for them. There is a rapid turnover of ward personnel in the Army; often the commanding officer of the hospital detachment can aid on this problem as can the chief nurse, if the psychiatrist will enlist their help.

Despite all the recognized handicaps, the psychiatrist, alert to the possibilities and willing to work to obtain them for his patients, can institute numerous therapeutic activities.

#### PSYCHOTHERAPY

As indicated above, the opportunities for individualized psychotherapy are limited—limited by time, manpower, training. That every patient should have all we can give him is much in order. Farrell and Kaufman<sup>3</sup> go so far as to state in their "Compendium on Neuropsychiatry in the Army" that "psychotherapeutic procedures are of primary importance and should be utilized to the fullest extent, even in conjunction with other forms of therapy." If there is a good chance that we can salvage a man for the Army (and often we do not know until we try), a reasonable effort should be made, allowing him, if necessary, three to five hours of individual therapeutic conferences. In our mental hygiene clinics (air fields) and our replacement training centers, as well as our many outpatient clinics, psychotherapy is often effectively given, and some of our best psychiatry in the Army is being done in these units.

3. Farrell, D. J., and Kaufman, D. R.: A Compendium of Neuropsychiatry in the Army, Army M. Bull. No. 66, April 1943.

Individual psychotherapy under sodium amytal is widely used in our hospitals, particularly in conversion hysteria, where often one to three sessions bring about a disappearance of the symptom. Reports from overseas neurotic reactions, "combat fatigue," and other psychological disturbances, indicate the wide usage of sodium amytal narcosis combined with psychotherapy.

One of the most fruitful opportunities in our Army hospitals for the use of psychotherapy is on our general medical and surgical wards. A very large number of patients are admitted to these wards with mild neurotic symptoms referable to the gastro-intestinal or cardiovascular systems. In many instances, these symptoms are directly related to factors in the soldiers' environmental situation: trouble in their units, disappointment over lack of promotion or officers' candidate selection, difficulties at home, a feeling of unappreciation, or failure to obtain furlough. Many times minor manipulation of the environment plus adequate airing of the problem to a sympathetic father image (the medical officer) is sufficient to resolve the difficulty—and salvage the man.

In several of our Army hospitals, group psychotherapy has been and is being used with varying degrees of success. In some instances, this method takes the form of lectures on mental hygiene subjects, followed by a question and discussion period. In other instances, it is planned to have the patients conduct much of each session in a discussion of their problems with the psychiatrists present to guide the proceedings. Reports by Hauptmann<sup>4</sup> and by Blair<sup>5</sup> have indicated successful use of a group technique.

#### OCCUPATIONAL—RECREATIONAL ACTIVITIES

One of our most practical and effective therapeutic activities for both psychotic and psychoneurotic patients has been the development of a well-organized, carefully planned and prescribed program of occupational, recreational, and educational activities. For such a program to be effective, it must be planned in detail, prescribed by the medical officer, and frequently checked on its efficiency. The desired end is to have a smooth-working schedule, providing a wide variety of activities throughout most of the patient's waking hours.

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4. Hauptmann, A.: Group Therapy for Psychoneuroses, *Dis. of the Nervous System*, 4:22, January 1943.

5. Blair, D.: Group Psychotherapy for War Neuroses, *Lancet*, Lond., Vol. I, No. 7, pp. 204-205, 13 Feb. 1943.

This program has as its aims (1) to provide outlets for the patient's interest, time, and energy; (2) to substitute these activities for the patient's inactivity, assuming we can in many instances substitute sublimations for symptoms; (3) to initiate all constructive efforts possible toward rehabilitation of the man, regardless of his eventual disposition. Such a program need not conflict with the very excellent convalescent programs now in operation. However, the primary aim of the convalescent program is to return the patient (most often post-operative or postinfectious) to full military duty<sup>6</sup> and, unfortunately, a majority of the neuropsychiatric patients will be returning to civilian life. While they await their discharge, whether it be a week or three months, their rehabilitation can be started and often they are greatly benefited if they can be fitted into an active program of occupation and recreation.

To operate such a program requires constant supervision by the medical officer. He must recruit the manpower from his fellow officers, nurses, and corpsmen, with the generous help of the Red Cross recreational workers and their Grey Ladies. His first step is usually a survey of his manpower to develop a "faculty"—locating the potential leadership and teachers for various crafts, skills, hobbies, games, and musical interests. After such a survey, he can determine the activities he can include in his program. In one of our hospitals, each medical officer on the neuropsychiatric section has charge of a class in his hobby: art work, photography, craft work, gardening, and stamp collecting. In another hospital, the neuropsychiatric chief persuaded the assistant chief of medicine to teach a chess class; in another, a Medical Administrative Corps officer conducts nature study classes; in still another a surgical nurse teaches clay modeling.

In every hospital the Red Cross workers have been enthusiastic and very helpful in the development of this program. Often one of them serves as the coordinator—arranging the meeting places for the classes or recreational activity, checking on the availability of the "teacher" or leader, providing the equipment or supplies. Often the Red Cross worker runs the "hobby guidance" program of craft work, initiates all social and entertainment features, and conducts the music class or group sings.

6. a. Convalescence and Reconditioning in Hospitals, Memorandum W40-6-43, Adjutant General's Office, 11 February 1943.

b. Convalescent Training Program for Patients in AAF Hospitals, A.A.F. Memorandum No. 25-9, 5 May 1943.

Occupational therapy under registered occupational therapists has been officially approved, although, because of the shortage of workers, it will be limited temporarily to general hospitals in the zone of the interior. The directive<sup>7</sup> setting forth the plan of organization states that "neuropsychiatric patients require occupational therapy. Morbid preoccupation and monotonous, empty days in a hospital extend and increase mental disability. Occupational therapy takes the mind from destructive thoughts and substitutes constructive activity. The importance of occupational therapy will increase when mental patients are held for definitive treatment." This same directive indicates the relationship between the occupational therapists (when such are present) and the Red Cross recreational workers.

Once a program of activities is begun, it can be developed indefinitely, limited only by the vision of the chief of the section and his helpers. It should be planned, with activities scheduled at certain hours and the total program outlined a week in advance, so that the physicians can prescribe specified activities for those patients they believe will benefit from them. The patient should be notified by the physician of the prescription, and it should be done with the same attitude with which a drug is prescribed; i.e., because it is therapeutically indicated and the patient is expected to follow the physician's orders. The leader or teacher or occupational therapist or Red Cross worker should not prescribe nor should he be given the responsibility or the task of "persuading" the patient into the activity.

The list of activities in operation at various hospitals includes a very wide range: all types of crafts; indoor recreation, especially individual tournaments and group games; outdoor recreation with the addition of drill and calisthenics; art work of all types; dramatics; educational groups in music, Spanish, chess, bridge, current events, mental hygiene; groups interested in radio, stamp collecting, book reviews, model making; gardening of various types; entertainments and socialization groups. These require, in addition to leadership, adequate recreational areas, a workshop (often utilizing a room on the ward), and supplies and equipment. Since they are primarily recreational, our Army regulations permit the expenditure of

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7. Occupational Therapy in Army Hospitals, Circular Letter No. 149, Office of The Surgeon General, 12 Aug. 1943.



monies from the hospital funds for such supplies for the benefit of the patients.

In establishing the program, it is desirable to start with a few activities and gradually add to these. It is wise to run them for short-term periods—two or three weeks—and to introduce changes or different forms as often as possible. Most important is the check on each activity: Is it effective? The physician should have a system for determining this, by reports from the teacher, the coordinator, and from a personal visit. Regularly scheduled conferences of the faculty are stimulating and helpful to all.

While this program, as outlined, is extensive, its benefits are in direct proportion. The more nearly specific our prescription can be for each individual in accordance with his past experience and interest, his intellectual capacity, his native ability, the more likely will the program be therapeutic for him. The experience to date in our hospitals has proved that such can be organized and be very beneficial, not only to the patients, but also for the whole neuropsychiatric personnel. Once in operation, it requires a minimal investment of time on the part of the medical officers.

#### PHYSIOTHERAPY

Some of our Army hospitals are excellently equipped with physiotherapy wards but rarely are these available for neuropsychiatric patients. The neuropsychiatric sections in our larger hospitals are occasionally provided with prolonged immersion tubs. In several instances, where the chief of the section has had little or no experience with hydrotherapy, even though a tub has been available it has been rarely used. The intent of The Surgeon General's Office is to provide continuous-flow tubs to all larger installations—an additional valuable therapeutic measure on our neuropsychiatric sections. Wet-cold sheet packs are much more widely used, though often no member of the nursing staff has had experience in their application.

#### SHOCK THERAPY

On 23 April 1943, The Surgeon General's Office approved<sup>8</sup> the use of insulin, metrazol, and electro-shock therapy in convulsive and subconvulsive shock dosage. It was presumed that one intent of the letter was directed toward the use of shock as a palliative in excited and combative cases which often be-

8. Shock Therapy in the Treatment of Psychiatric Conditions, Circular Letter No. 88, Office of The Surgeon General, 23 April 1943.

come much more tractable following one or two shock treatments. There is no contraindication or instruction against its use as a remedial measure, if manpower and bed space are available. Specific qualifying conditions were outlined for its use as follows:

a. Only psychoses believed to have a poor prognosis without shock therapy will be so treated.

b. The treatment will be given only by or under the direct supervision of a qualified neuropsychiatrist experienced in the form of treatment used, whose qualifications will be approved by the commanding officer of the hospital.

c. A complete recorded physical evaluation will be made to preclude contraindications. This will include electrocardiogram and, when possible, electroencephalogram and, except in the case of insulin, x-rays of the spine.

d. All precautions to prevent complications will be observed.

e. All cases for which shock treatment is proposed by the ward officer will be carefully reviewed by the Chief of the Neuropsychiatric Section, who will approve or disapprove the proposed treatment.

f. A carefully prepared running record of the treatment will be made part of the clinical record.

g. A complete report of any complications will be forwarded immediately, through channels, to the Office of The Surgeon General.

As a result of this directive, shock therapy is being widely used in our Army hospitals. The qualifying conditions must be closely followed, the most important one being its application only by medical officers experienced in its use. The development of a "shock therapy team" of physician, nurse, and corpsmen is highly desirable, if not a necessity, for its safe usage.

The correct and appropriate use of shock therapy has left no doubt as to its value. It should certainly be available in our larger hospitals. The approval of its use by The Surgeon General adds another therapeutic aid to our neuropsychiatric wards.

#### DRUG THERAPY

Every opportunity for drug therapy existing in any civilian psychiatric hospital is available to the medical officers of the Army neuropsychiatric wards. There is no limitation, except those imposed by clinical judgment, on the use of vitamins, sedatives, benzedrine, and endocrine preparations.

#### MANAGEMENT BY WARD PERSONNEL

Every thoughtful psychiatrist knows the immense importance of his personnel in the treatment of his patients. On them rests largely the responsibility of directing the daily lives of the patients. One may say quite literally that the personnel

on the psychiatric ward is the "medication" for the patients. It has long been recognized that the psychiatric nurse is an extremely important treatment adjunct particularly on a male psychiatric ward. Her position as a symbolic maternal figure makes it possible to be of inestimable help to her patients. If well trained and of the suitable personality, she can often do things for the patients or get them to do things which no male attendant could ever accomplish. Many combative patients who, if approached by a man, would become more so, will meekly follow the orders of a tactful nurse.

Too often it is impossible to obtain either nurses or corpsmen who have had psychiatric experience. If we are to accept the established fact regarding their importance on our wards, we must provide training for them even at the expense of other activities. In nearly all the Army hospitals in the Fourth Service Command, continuous (because of frequent changes in personnel) courses of instruction, lectures, and clinics, are conducted for the nurses, corpsmen, Red Cross workers, and other personnel on the neuropsychiatric section.

#### SUMMARY

Despite shortage of manpower, handicaps in physical facilities, rapid turnover of patients, and an untrained and frequently changing ward personnel, the opportunities for treatment of neuropsychiatric patients in our Army hospitals are extensive. They include psychotherapy, occupational and recreational activities, hydrotherapy, shock therapy, drugs, and milieu therapy. Furthermore, these are already being widely applied. As long as we claim to be practicing physicians, our fundamental interest must be in the welfare of our patients—their therapy. Despite the pressure of other important functions of the neuropsychiatrist in the Army, he should be on the alert to utilize every therapeutic opportunity so far as his energy, time, and ingenuity will permit.

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**The Veteran and the Novice.**—A general principle to be kept in mind by military psychiatrists is that though they may be tolerant and even generous when inducting men into the Army, rejecting for combat services even the doubtful cases, once a man has been enrolled and trained as a soldier, all efforts should be made to keep him in the Army in the event that he becomes ill or injured. In other words, even if there are sufficient new recruits, it is always preferable to restore a veteran rather than to replace him by a novice.—Mira, Emilio: *Psychiatry in War*. New York: W. W. Norton Co., 1943.

# Cartilage Banks

LIEUT. COLONEL LESLIE L. NUNN  
Medical Corps, Army of the United States

Human cartilage is found to be the most satisfactory medium to be employed in the definitive treatment of bony defects of the face, especially of the nose, malar region, and supra-orbital regions. Until recent years it has been the custom of operators to use the patient's own cartilaginous rib end to fill in these defects. This procedure has certain disadvantages; although there is no permanent disability as a result of removing one or more rib cartilages, the procedure is time consuming, the incision curiously is painful for many days, in the female additional scarring is not desirable, and there always is a certain hazard involved in the removal of costal cartilages.

In seeking a method to avoid these disadvantages, other workers have done original work on autografts, homografts, and heterografts. Straith and Slaughter<sup>1</sup> stress that preserved homocartilage is the only one which merits use in restoring facial contour. New<sup>2</sup> continues to employ autografts of costal cartilage but boils the cartilage in "merthiosaline" for ten minutes prior to the actual implanting into the tissues. This procedure according to the author tends to prevent warping of the cartilage after it is implanted. Peer<sup>3</sup> buried nine segments of costal cartilage with perichondrium removed, beneath the chest skin of 9 patients and three segments of costal cartilage with perichondrium intact beneath the nasal skin of 3 patients. He then removed the implants at intervals of six months to six years and found on microscopic examination a total absence of invasion or absorption of the grafts.

Since it has been conclusively proved that homocartilage, properly preserved, is the ideal medium for the restoration of certain defects in facial contour, it follows that a properly established cartilage bank will furnish a ready source of cartilage and eliminate certain disagreeable features connected

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1. Slaughter, W. B., and Straith, C. L.: Grafts of Preserved Cartilage in Restorations of Facial Contour, *J. A. M. A.*, 116:2008-2013, 3 May 1941.

2. New, G. B.: A Method to Prevent Fresh Costal Cartilage Grafts from Warping, *Am. J. Surg.*, 54:435-438, November 1941.

3. Peer, L. A.: Fate of Autogenous Septal Cartilage after Transplantation in Human Tissues, *Arch. Otolar., Chic.*, 34:696-709, October 1941.

with the use of autografts. Obviously the establishment of a cartilage bank is much simpler in military than in civil practice. The author established a cartilage bank at the Barnes General Hospital, Vancouver Barracks, Washington, early in 1942. A similar bank has been set up at this general hospital more recently. In view of the amount of plastic and reconstruction surgery of the face which will be necessary during and following the present war, the cartilage bank will be a forward step in facilitating the rehabilitation of these cases.

Cartilage best suited for implanting is to be found in young healthy individuals who have met accidental death. Cartilage from joint surfaces has been mentioned but the most suitable is costal cartilage. In establishing a cartilage bank the following plan is carried out: The cadaver of a young adult male who has been accidentally killed within the past few hours is selected. The fact must be established that he is free from syphilis and tuberculosis. Blood type has no bearing on the case. As soon as possible after death the anterior chest wall is prepared as for a surgical procedure and is opened in the mid-line by the operator under aseptic precautions. All costal cartilages on both sides are removed with rib shears and knife and all possible intercostal and pectoral muscles are removed. These segments of cartilage are placed in sterile normal saline solution. They can now be prepared either immediately or placed in the ice box to be cleaned and prepared within the next forty-eight hours. In cleaning the cartilage of perichondrium and muscle, it is essential to observe strict surgical asepsis. All perichondrium must be stripped and scraped off leaving glistening, white, smooth cartilage. These segments are now placed in a solution consisting of one part aqueous solution of merthiolate and four parts of physiologic saline solution which has been previously referred to as "merthiosaline." A pint economy-type jar is the ideal container. Just before the cartilage is covered with the solution a culture is made. The jar is now placed in the ice box and the solution is changed every three weeks. Each time the change is made the cartilage is cultured. On one occasion, I was obliged to use aqueous solution of mercurochrome for a temporary preservative and although subsequent implants of the cartilage proved quite satisfactory, the cartilage was stained a bright pink throughout. This is avoided in using aqueous merthiolate.

Preserved cadaver cartilage is believed to be the ideal medium for repair of certain bony defects of the face. Cartilage thus preserved is completely inert and if taken from a healthy source can be implanted with impunity regardless of age, color, sex, or blood type of the patient. A method of the establishment of cartilage banks is described.

## Bedbug Control in a Large Army Camp

CAPTAIN WILSON W. TOWNE

Sanitary Corps, Army of the United States

and

SECOND LIEUT. EUGENE J. GERBERG

Sanitary Corps, Army of the United States

Many thousands of soldiers have passed through this camp in Virginia since January 1941 and, as in most places housing transient populations, bedbugs made their appearance. During the second year of occupancy of the camp, these pests were reported in such increasing numbers that a sanitary detail of one officer and from four to eight enlisted men was kept busy investigating complaints and supervising local control measures. Early in 1943 it became necessary to use two sanitary detail units to satisfy the demands for disinfestation. The repeated complaints received from the same buildings indicated that the methods of control in use were inadequate. This could partly be attributed to failure to disinfest the clothing and web equipment of each man and to the wooden double-decker bed supports which were very difficult to thoroughly disinfest with liquid insecticide. As entire buildings were badly infested, adequate control by the methods in use would be costly and time-consuming and the spraying would have to be repeated often to destroy the newly hatched bugs. In view of these facts the camp surgeon's office gave consideration to other control methods and recommended the use of hydrocyanic acid gas discoids.

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Colonel E. H. Gist, M.C., Camp Surgeon, and Lieut. Colonel L. V. Bean, C.E., Camp Engineer, gave advice and assistance in conducting this program. Lieut. Colonel W. J. Rogers, Sig. C., Camp Signal Officer, provided the illustrations.

The post engineer was authorized to proceed with the method suggested and the camp medical inspector's office was asked to assist the engineers in this work. Because of the seriousness of the situation and the expense if the job were let out on contract to commercial exterminators, it was decided to use the sanitary detail to supervise the sealing of buildings and to release the gas, and to use engineer labor to do the actual sealing. One assistant medical inspector, the junior author, directed the field activities of the sanitary detail.

The greatest infestation was in the QMRTC area where nearly 90 percent of the buildings were affected. It was considered desirable to treat all barracks rather than leave the lightly infested ones as foci of future infestation, and to confine the treatment to one or two regimental areas, rather than skip, hit or miss, over the entire camp. About 400 buildings required fumigation. A uniform plan of operation was developed in order to simplify the work for the organizations being fumigated and the sanitary detail and to cut the labor costs to a minimum. The post surgeon and the post engineer authorized a building to be fumigated only after inspection by a representative of the camp medical inspector showed that local control measures would be inadequate. Preparatory to starting work in a regimental area, the following arrangements were made:

1. The commanding officer was asked to appoint one officer to arrange the housing of troops, to see that proper preparatory measures were taken by unit commanders, to arrange for guards, and to act as liaison between the regiment and the camp surgeon's office.

2. The regiment was requested to furnish about twelve enlisted men including one carpenter from each company to do most of the sealing.

3. The regimental fumigation officer was instructed in the proper arrangement of the contents of buildings to insure positive penetration of the gas.

4. The carpenter detail was instructed in proper methods of sealing.

5. The regiment was requested to plan so that at least one company area could be fumigated in one operation.



## METHOD OF PROCEDURE

The actual operations were conducted as follows:

1. The day before a company area was to be fumigated the carpenter detail sealed the ventilator openings, wedged alternate windows, and sealed some of the doors. Only a short time was necessary on the next morning to have the building ready for gassing. These details became very efficient.

2. Each man in the barracks was responsible for arranging his bedding and personal effects in a uniform manner before leaving the building on the day of fumigation. Sheets, blankets, and comforts were hung from the ceiling; foot lockers and barrack bags were opened and equipment was disassembled and placed on the mattress. Web equipment in storage was removed and distributed throughout the barracks being fumigated. Each man was permitted to take out of the building only the minimum of personal clothing and toilet articles wrapped in a towel. Foodstuffs, tobacco, and unexposed camera film were removed from the building.

3. On the morning of fumigation, the buildings were inspected by the sanitary detail to insure proper sealing and arrangement of the contents.

4. Guards were posted and given special orders.

5. The unit commander with the officer in charge of the sanitary detail and at least one man from that detail made a final inspection of each building to insure that no one remained therein.

6. Three men from the sanitary detail distributed the gas in the form of HCN discoids; one opened cans, one spread discoids, and one was a safety observer.

7. On completion of gassing, exit was made through the one unsealed door, which was closed, then sealed and barred with a wooden strip across the doorway, and a danger warning sign placed in proper position.

Windows were wedged, by hand, with wooden wedges placed two on the outside at the bottom of the upper sash so as to push the window in and up and two on the inside at the top of the lower sash to push the window out. Scotch masking tape was used for sealing the exit doorway from the outside. All other doors were sealed with either tape or newspapers which were folded and placed around the door casing, and the door closed thus sealing the cracks effectively. All ventilator openings were sealed with kraft paper, but during

warm weather the louvers near the roof ridge in either end of the building were left unsealed. These louvers were sealed, however, with the approach of cooler weather and the buildings were also preheated to obtain a room temperature of about 85° F. before the gas was released.

Following a contact period of not less than five hours, two members of the sanitary detail returned to the buildings, opened the doors, pulled the wedges holding the upper sash

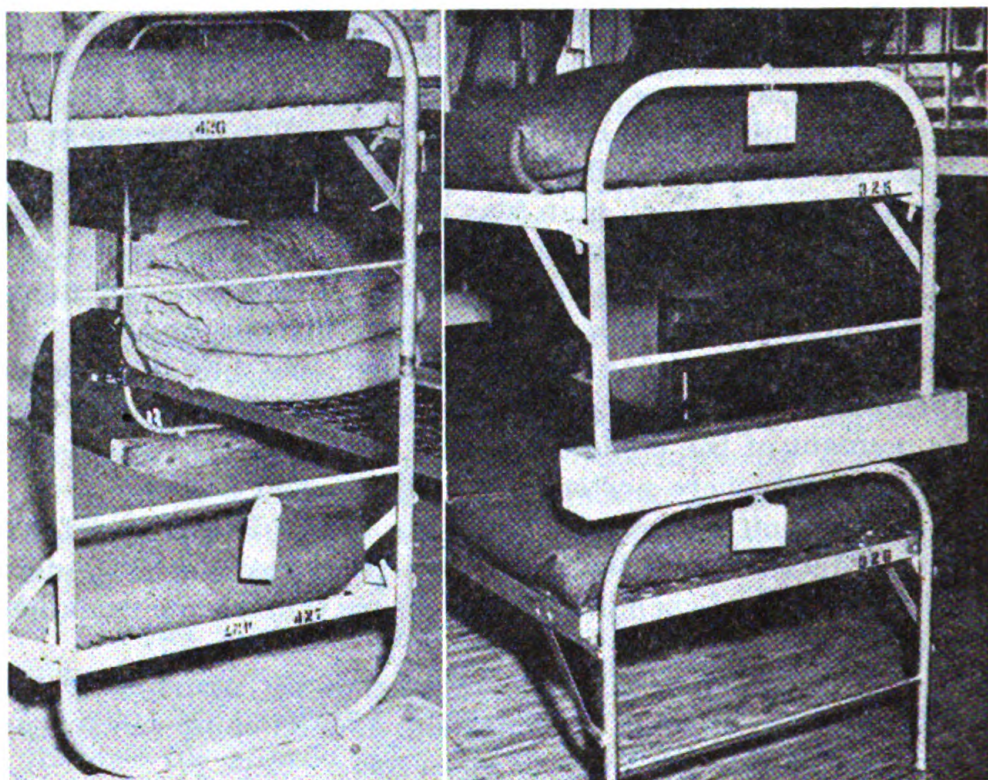


FIGURE 1. Improved methods of "double-decking."

on lower floor windows, removed the fresh air intake seal, and started the ventilator fan. The detail returned the following morning to complete opening all windows and to make tests for the presence of gas by means of color comparison test papers. If the tests were negative, the building was released to the unit, and if not, additional tests were run until negative results were obtained. During the summer and early fall, the buildings were usually negative when checked in the morning following fumigation; seldom was it impossible to return the building for occupancy later than noon. A post fumigation



inspection was made of each building and a report was filed with the post engineer and the post surgeon.

During warm weather when no heating was required, five cans of discoids ( $2\frac{1}{2}$  lb. of gas each) per mobilization type 700 series barracks were used, or about 4 oz. per 1,000 cu. ft. The same concentration was used in buildings of different cubic contents. When outside temperatures were such as to require heating, the concentration was increased 20 per cent.

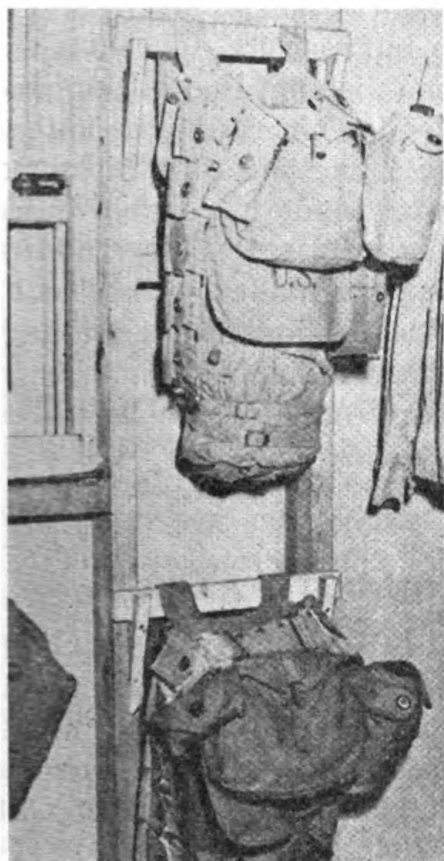


FIGURE 2. Packs hung on wooden bars away from bunks.

This program was very effective. With a detail of one officer and from six to eight enlisted men, as many as 21 barracks were gassed in one day, although it was preferable to limit the number to about 12 per day, especially where the organization desired early use of the buildings. Failure in delivery of gas held up the work for some time. From 10 July to 25 November 1943, a total of 416 buildings was gassed, 236 having been done in October. The exact labor costs are not available for the entire period; however, the labor costs after 12 October 1943, during which time 169 buildings were gassed, were \$66.46.

More engineer labor had been used previous to this time, but it is believed that the total cost for such labor for the entire period did not exceed \$500. The cost for material other than gas was slightly in excess of \$200. The cost of gas used was \$5,415. The total cost, therefore, was about \$6,115. The cost per building for gas averaged \$13.02 and for labor and material (other than gas) \$1.68, giving a total unit cost of \$14.70 per building.

Post fumigation inspections failed to disclose a single live bug in any building gassed and to date no reinfestations attributed to failure of effective gassing have been reported.

With a transient population, it may be expected that some reinfestation will occur. The camp surgeon's office has inaugurated, therefore, a program which will provide early bedbug detection and extermination. The various units will conduct weekly inspections of barracks and report any reinfestation at once to the camp surgeon's office. Replacement of the old type wooden frame for double-decker beds with one with less likely breeding places (figure 1) and removal of packs and web equipment from bunks were advocated; a very satisfactory method of accomplishing the latter was devised in one unit. A horizontal wooden bar resting in slotted supports was nailed to the studding, a method that improved the neatness of the building and also made it possible more rapidly to put on the equipment (figure 2). Posters showing methods of detection and extermination made by the Technical Training Service, QMRTC, were distributed to each barracks to impress each individual officer and enlisted man with his responsibility for detecting and exterminating the first bedbug to appear in his part of the barracks.

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### **COURSES FOR OCCUPATIONAL THERAPISTS**

The orientation courses for occupational therapists which were scheduled each two weeks through March at the Lovell, Lawson, and Letterman General Hospitals will be continued, but will be given once each month according to the following scheduled dates, announced in A.S.F. Circular No. 35, 31 January 1944:

Reporting date—15 April 1944, 13 May 1944, 10 June 1944.

Opening date —17 April 1944, 15 May 1944, 12 June 1944.

Closing date —29 April 1944, 27 May 1944, 24 June 1944.

All newly appointed occupational therapists will be assigned to one of the above courses at the convenience of the hospital in which she is employed by arrangement with the hospital conducting the courses. The purpose of this course is to familiarize the occupational therapist with the organization of the Army, the Medical Department of the Army, and with the particular problem of the care and treatment of sick and wounded military personnel.

# Cyst in Sinus Containing Supernumary Molar

## Report of Case

CAPTAIN JOHN E. PLEASANTS

Dental Corps, Army of the United States

A soldier, aged 29 years on 14 May 1943, complained of a foul tasting and smelling discharge into his mouth emanating from the upper third molar area. For eight years periodically he had a painful swelling on the left side of his face which recurred every few days. His local dentist took radiographs and diagnosed an abscessed upper left third molar which was extracted and the condition apparently cleared up.

About one year later the swelling, pain, and discharge reappeared and, after further radiographs were taken, the upper left second molar was extracted. The condition again apparently cleared up for about three years, then reappeared, accompanied by swelling, pain, and a putrid discharge for two days. Additional radiographs were taken and the upper left first molar was extracted.

The condition remained dormant for a year and a half and again became active. On this occasion, after taking intra-oral films, the dentist extracted the upper left second bicuspid. The discharge persisted, following this extraction but without swelling or pain.

### EXAMINATION

Oral examination showed healthy normal-looking gingiva and mucous membrane with the exception of a small area the size of a pea on the buccal gingiva in the upper left third molar area where there was slight inflammation and tenderness. On palpation there was slight oozing of pus with a foul odor. A probe could be inserted about one-sixteenth of an inch. Intra-oral radiographs disclosed a long curved fistulous tract in the bony structure, but did not show the offending tooth.

A flexible stainless steel .018 gage wire was probed into the fistulous tract for about one and one-quarter inches where it met with a solid body. An occlusal plane radiograph taken with the wire in place (figure 1) disclosed a tooth at the end of the fistulous tract. A radiopaque oily substance was in-

jected into the opening to determine whether there was a walling off and separation from the maxillary sinus. A lateral plate and a P-A view were then taken. After consultation it was decided that the molar was lying in the anterior medial wall of the maxillary sinus, and the case was diagnosed as a dentigerous cyst in the maxillary sinus containing a supernumerary unerupted molar.

The mouth was clean but a foul odor was evident. All the lower teeth were present.

The upper right first and third molars were missing and the upper left teeth recently extracted. No caries was evident.

#### OPERATION

Sodium amytal, 3 gr., was administered in capsule form one-half hour prior to the operation; local anesthesia, a 2 per cent solution of novocain, pontocain, cobefrin 1:50,-

000 was given; an infra-orbital block, a posterior superior alveolar, and an anterior palatine block on the left side.

A horizontal incision was made in the buccal alveolar mucosa, parallel with the gingival crest and one-fourth inch above it, extending from the cuspid, distal to the third molar area. The mucoperiosteal flap was elevated and retracted well above the root end of the first bicuspid. An opening was chiselled into the antrum and enlarged with rongeur forceps to about the size of a quarter. The crown of the unerupted molar was exposed in the point of the antrum highest up, and brought to the opening with the use of elevators and delivered through the opening with a bayonet-type forceps. No evidence of penetration of the orbital plate was found. The tooth was a large, well-formed molar with three fused roots, curved at a 45-degree angle. The cystic membrane surrounding the tooth and the fistulous tract were then removed. The entire lining of the antrum was not removed or curetted as it had not degenerated.



FIGURE 1. Showing the fistulous tract and the supernumerary molar.

Sterile sulfanilamide crystals were placed in the cavity which was then loosely packed with one-fourth inch sterile gauze. The primary incision was closed with black silk suture, except a small area through which the gauze protruded. The patient was given an initial dose of 3.0 gm. sulfadiazine followed by 1.0 gm. sulfadiazine every four hours. After the fourth day his sulfadiazine concentration was 8.3 mg. per 100 cc. blood. The drug was discontinued. One half of the gauze was removed the second day following the operation. The fifth day the remaining gauze was removed and the patient was discharged from the hospital on the sixth day. Fourteen days after the operation the fistula and the incised area were completely healed. The patient reported no foul taste or odor and a completely normal feeling.

#### COMMENT

This case demonstrates the need for occlusal and lateral radiographs. While intra-oral radiographs are invaluable and often times give much more detail in dental work than larger plates, they are limited in scope. All pathologic anomalies discovered with intra-oral films should be supplemented with either occlusal or lateral films, or both. It is difficult to obtain a clear conception of many conditions without them.

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**Formula for Use of Sea Water in Bread.**—A shortage of fresh water or salt need no longer be a handicap to the Army's bread makers. Through tests made in the Quartermaster Corps Subsistence Research Laboratory in Chicago, a formula for substituting sea water for fresh water and salt in bread making has been developed, the War Department has announced. Samples of sea water taken from oceans around Florida, Virginia, California, and Washington were tested for salt and mineral contents, strained to remove suspended matter such as algae, seaweed, and sand, and then treated with calcium hypochlorite for purification. Instead of using 60 parts of fresh water and two parts of salt, the laboratory technicians used 62 parts of salt water. Other ingredients, as well as procedure, were not changed. The finished product showed only a slight variation from bread made according to the standard recipe in grain, texture, flavor, and crumb color. It is expected that the new formula will be included in The Army Baker, the Army's baking cook book, used in schools for bakers and cooks.



# Calories Expended in Military Activities

**MAJOR HERBERT POLLACK**

Medical Corps, Army of the United States

**FIRST LIEUT. CYRUS E. FRENCH**

Sanitary Corps, Army of the United States

and

**CAPTAIN GEORGE H. BERRYMAN**

Sanitary Corps, Army of the United States

One of the basic requirements of a ration is that it provide calories adequate for the work to be done. When the intake of metabolizable energy is less than the energy output, a loss in body weight occurs. The term "body weight" as used here refers to the actual loss or gain of tissue, and not to fluctuations in gross weight which are due primarily to changes in water balance. Since the caloric content of many foods is widely known, the intake of individuals can be readily estimated. However, the caloric expenditure cannot be so easily determined for various kinds of work which individuals are required to perform. This is particularly true with regard to the activities of a military training program.

During World War I, Cathcart, the British physiologist, determined representative caloric expenditures of British soldiers by means of the Douglas bag technique. F. G. Benedict of the Carnegie Institute in this country carefully determined the caloric expenditure of a man while marching at various rates of speed. These values could be used for certain standard work procedures, such as marching with or without pack, fatigue details, eating, and sleeping. The training schedules of the Army today have introduced previously unmeasured activities, for example, obstacle courses, field rushes, digging foxholes, and specialized calisthenics. The development of a table of caloric expenditures for such military duties involved the division of these complex maneuvers into their measurable components. The sum of the values assigned to these components is considered to be the caloric expenditure for that particular kind of work.

In addition to information already available, additional data pertaining to caloric expenditure during field activities

have been obtained directly with cooperation of the Harvard Fatigue Laboratory,<sup>1</sup> using the Douglas bag technique. From these observations and data in the literature, a table of caloric expenditures for current training activities has been compiled. With minor exceptions, all values in the table are based on the caloric expenditure of a 150-pound man working for fifty minutes and resting for ten minutes during each hour. However, other periods of nonactivity inherent to the formations described are included in certain work periods. For example, in a thirty-minute period of calisthenics only fifteen minutes are spent in actual exercise, and during a crawling and creeping period, there is a total of fifteen minutes in the prone rest position between movements. The values for certain field activities include five minutes' marching to and from the area, or a total of ten minutes. Where this is exceeded, adjustment should be made.

At the end of the table, the caloric expenditure during two sample days has been worked out in detail. An alternative method involves the calculation of a value termed, for convenience, the "basal plus" value. The latter is a standard which can be used grossly each day to cover the caloric expenditure during sleeping, eating, off duty, toilet, ten minutes off during each working hour, etc. To the "basal plus" value, there need be added the value for each fifty minutes' activity during working hours. The necessary amount of calculation is much decreased by this procedure. Both the "hour-by-hour" and the "basal plus" methods produce the same caloric expenditure value for any given day.

#### TABLE FOR ESTIMATING CALORIC EXPENDITURE

To appraise the adequacy of a ration, the following caloric output values for various military activities have been found useful. Many of these values have been recently checked on soldiers by the Douglas bag technique. The table is considered generally dependable for the average soldier weighing 150 pounds. The values listed (except those marked with asterisk) include the customary ten-minute rest period in each hour. The unadjusted caloric values per hour, if desired, may be computed from the values below by subtracting 21 and multiplying the remainder by 6/5.

Activity	Calories per hour
<i>Off duty</i>	
Sleeping*	67
Eating*	75
Off duty in area	130

1. Dr. R. E. Johnson and his assistants reported these observations to the S. G. O. on 12 July 1943.

Activity	Calories per hour
<i>Clean up</i>	
Inspection	130
Policing area	130
Toilet*	100
Fatigue details—raking up, etc.	130
<i>Athletics</i>	
Mass games	271
Touch football	188
Softball	188
Volley ball	188
Wrestling, by pairs	310
Boxing, by pairs	310
<i>Basic training activities</i>	
Calisthenics*: One-half hour consists of 15 minutes of standing about between exercises, and 15 minutes' activity including 1 minute of running in place, 50 side straddle hops, 48 squat hops, 15 pushups, 50 knee-bends, 10 minutes of light arm exercise.	300
Calisthenics with rifle	396
Close order drill	255
Close order drill with rifles	275
Bayonet drill	201
Bayonet drill dummies	201
Hand grenade drill	137
Manual of arms	171
Gas mask drill	137
Rifle marksmanship	171
Obstacle course	293*
Obstacle course with rifle	340*
Obstacle course with rifle and pack (27 lb.)	393*
	(*Values where activity consists of 20-minute obstacle course and 30-minute march to or from the course.)
<i>Marches (50-minute march plus 10-minute rest)</i>	
Retreat parade	171
Field march	289
Field march with rifles	338
Marching on level with light pack (27 lb.) and rifle (9 lb.), 50 minutes of marching and 10 minutes' rest, covering 3 miles.	410
Field march with rifles and heavy pack; as above.	455
<i>Extended order and maneuvers (activity as described)</i>	
Field rushes with full equipment (repetition of 5 seconds' running, 10 seconds' lying prone). One hour consists of (a) 10 minutes' march to area; (b) 40 minutes' rushing in which 5 seconds' running followed by 10 seconds' lying prone is repeated for 40 minutes; 10-minute rest at end.	415
Creeping and crawling with full equipment. One hour consists of 20 minutes' marching, 10 minutes' resting, 7½ minutes' creeping, 7½ minutes' crawling both high and low, with 15 minutes of prone resting.	405

Activity	Calories per hour
Creeping and crawling as above without equipment	305
Obstacle course with light pack and rifle. Course lasts about 5 minutes and consists of pit jump, hurdles, log crossing, ditch jump, maze run, log step climb, ditch climb up and down, 12-foot landing net climb, high tunnel run, log ladder up and down, broken field run, low tunnel crawl, rope swing, high fence climb, one log sitting bridge, walking log bridge, and parapet ditch jump. One hour consists of 20 minutes' marching, 2 circuits of course, and 20 minutes' rest.	380
Digging foxholes. Two hours consists of 20-minute march, 80 minutes of digging (half the time spent resting) followed by a 20-minute break.	240
Rifle exercises. One-half hour consists of 15 minutes of standing about, and 15 minutes of exercises including 32 squat hops with rifle above head, 36 side lunges with rifle, and other exercises as in calisthenics, but with rifle (Butts' Manual).	450

## CALORIC EXPENDITURES DURING TWO SAMPLE DAYS

Time	Activity	Caloric expenditure (150-pound soldier)
<i>1st day</i> (Hot weather schedule)		
5:00 a.m.	1st call	
5:10	Reveille	25
5:15-5:45	Calisthenics	150
5:45-6:00	Rest and fatigue duties	25
6:00-6:30	Breakfast	55
6:30-7:30	Calisthenics with rifle	450
7:30-8:30	Creeping and crawling without equipment	305
8:30-9:30	Field march, without pack or rifles	289
9:30-10:30	Obstacle course	380
10:30-11:30	Field march, without pack or rifles	289
11:30-12:00	Rest and fatigue duties	50
12:00-12:45 p.m.	Dinner	85
12:45-2:45	Rest and fatigue duties	200
3:45-4:45	Boxing and wrestling	310
5:15-5:30	Rest and fatigue duties	25
5:30-6:15	Supper	85
6:15-7:15	Close order drill	255
7:15-8:15	Calisthenics with rifle	396
8:15-9:30	Fatigue duties	162
9:30-5:00 a.m.	Bed	525
	Total	4,061

<i>2d day</i> (Normal weather schedule)		
5:00 a.m.	1st call	
5:10	Reveille	25
5:15-5:45	Calisthenics	150
5:45-6:00	Rest and fatigue duties	25
6:00-6:20	Breakfast	35
6:20-6:45	Fatigue duties	50
6:45-11:45	Road march (light pack and rifle)	2,050
11:45-12:00	Fatigue duties	30
12:00-12:45 p.m.	Dinner	35
12:20-1:15	Rest and fatigue duties	100
1:15-4:15	Road march (light pack and rifle)	1,230
4:15-5:30	Fatigue duties	150
5:30-5:50	Supper	35
5:50-9:30	Off duty in area	365
9:30-5:00 a.m.	Bed	525
Total		4,805

**MEDIUMS FOR DISSEMINATION OF INFORMATION**—Since 1 January 1919, The Surgeon General has employed circular letters as a medium for the dissemination of information and instructions of a technical and professional nature to assist and guide members of the Medical Department in the care and treatment of the sick and injured. With the exception of Circular Letter No. 1, Office of The Surgeon General, dated 1 January 1944, circular letters of The Surgeon General's Office were discontinued as of 31 December 1943. Material formerly published through the medium of circular letters will henceforth be issued in War Department Technical Bulletins,<sup>1</sup> Supply Bulletins,<sup>2</sup> and Modification Work Orders.<sup>3</sup> These bulletins may contain also advance notice and information concerning pending changes to War Department publications.

Technical bulletins which do not pertain to a manual will bear the abbreviation indicating the originating service (MED for Medical Department) and consecutive numbering. For example, TB MED 1, Oxygen Therapy Apparatus Closed Circuit: Boothby-Lovelace, Medical Department Item No. 93640, was the first technical bulletin issued by the Medical Department not directly pertaining to a single technical manual.

Technical bulletins pertaining to technical manuals will bear the number of the manual, with an added serial number to differentiate one bulletin from another on the same subject. For example, TB 8-260-1 would indicate the first technical bulletin which affected Technical Manual 8-260. Material of a supply nature, formerly published in S. G. O. Circular Letters will be issued in War Department Supply Bulletins<sup>2</sup> and War Department Modification Work Orders.<sup>3</sup>

Some of these bulletins will be given a limited distribution. There may be gaps, therefore, in serial numbers that any one officer will receive. All of the above publications will, however, be included in the Monthly Digest of War Department Directives and Index to General Orders, Bulletins, and Numbered Circulars with the distribution of each indicated therein.

1. See Circular No. 297, War Department, section IV, dated 13 November 1943.

2. See Circular No. 6, War Department, section IV, dated 4 January 1944.

3. See Circular No. 4, War Department, dated 4 January 1944.

# Apparatus and Clinical Notes

## OSTEOTOMY OF RAMI OF LOWER JAW

MAJOR WILLIAM H. TRAYNHAM, JR.  
Dental Corps, Army of the United States

The operation reported here is among the first of its kind to be done in the Army. While Doctors Ivy and Curtis of the University of Pennsylvania, state that it has been done successfully for the last ten years. It is not known who performed it first.

### Report of Case

The patient came to the dental clinic at Morris Field, Charlotte, N. C., 1 October 1943, to have some type of dental prosthesis constructed to qualify him for aerial gunner. The lower anterior teeth extended almost an inch beyond the ridge of the maxilla and, in closing, the patient's lower teeth would touch his nose. It was impossible for him to make any type of occlusal contact. Full upper and lower dentures were considered but, after study models were constructed, this was ruled out because of the marked protrusion of the lower jaw.

The patient was not qualified for overseas service and was definitely disqualified as an aerial gunner. After several days' observation, it was noted that he had an inferiority complex because of his abnormal facial expression resulting from this type of prognathism. He was extremely anxious to have the deformity corrected in order to be kept in the military service. Operation was definitely indicated.

### Examination

Oral examination revealed that in the upper jaw the patient had, on the right side, a peg-shaped cuspid in the region of the second bicuspid and a second and third molar. On the left side only a peg-shaped cuspid and a second molar remained. The lower jaw consisted of six normal anterior teeth and the two first bicuspid possessing full cast gold crowns. The general health of the patient was good and he presented a normal oral condition.

*Constructing a acrylic splint and establishing centric relation.* Upper and lower hydrocolloid impressions were taken, poured in stone and mounted on an articulator. The problem arose as to how much the lower jaw was to be moved back by the operation. To determine this the lower case was moved back to the approximate position that would result in normal occlusion. Since partial dentures were to be

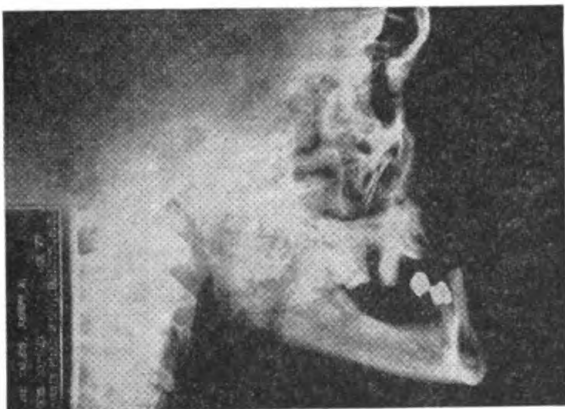


FIGURE 1. X-ray of face before operation, lateral view.

constructed for the case after the operation, the main point of importance here was the amount of overjet that was to be produced. After the centric

Official photographs, U. S. Army Air Forces.

relation was established on the articulator by moving the lower cast back to the position that was desired, an acrylic splint was constructed for the lower jaw (figure 2). Two thicknesses of wax were placed around the labial and lingual surfaces of the lower teeth and a bite block formed on posterior ridge for the upper molars to rest in (figure 3). Wires bent into

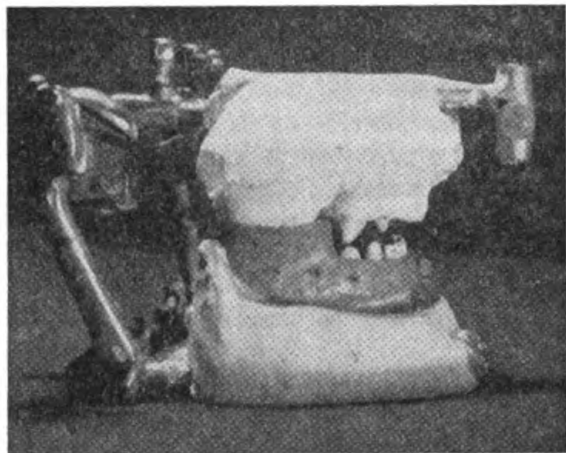


FIGURE 2. Centric relation established on the articulator, showing the upper molar teeth fitting into wax bite block which was made into acrylic splint.

hooks were placed into this block. The case was then invested and flaked, using colored acrylic as the material of choice. After the acrylic splint was adjusted and wired together in the patient's mouth, another problem was how to stabilize the lower jaw in correct relation to the upper teeth following its fracture and during the period of healing. Since the only teeth remaining were peg shaped and did not offer sufficient retention for any type of wiring, another method was used. Wires were passed through the ridge of the maxilla to the lingual (figure 4), buttons were threaded on, and the wires passed back through the same opening to form loops on the buccal and labial surfaces to which elastic bands were attached which were to connect them to the hooks on the lower splint following the operation. With the acrylic splint in place of the elastic bands in proper positions, the patient was then ready for the operation.

*Surgical procedure.* The following morning the patient was prepared for the operating room. Sixty grains of sulfadiazine were given as a prophylactic measure and sodium pentothal was used as the anesthetic. The anatomical landmarks were observed; namely, an imaginary line was drawn from the tip of the mastoid process to the lower border of the malar bone. A small vertical incision was made on the imaginary line, posterior to the border of the ramus of the mandible. A conductor for the Gigli saw (or conductor for the Jeffrey

hooks were placed into this block. The case was then invested and flaked, using colored acrylic as the material of choice.

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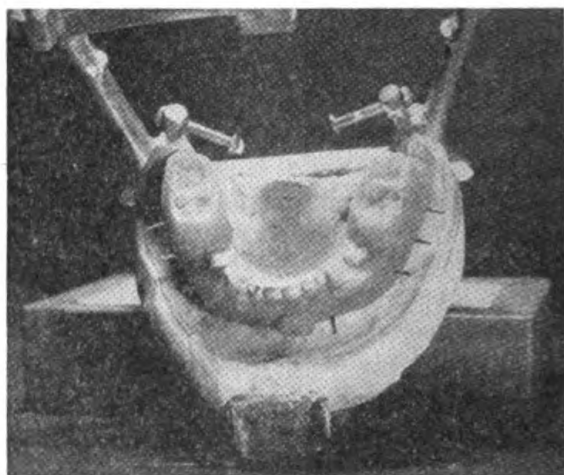


FIGURE 3. Occlusal view of the wax splint.



saw) was passed, going between the periosteum and the bone. Once the conductor was under the periosteum and it passed under the posterior border of the ramus, then pressure was exerted outward and the conductor

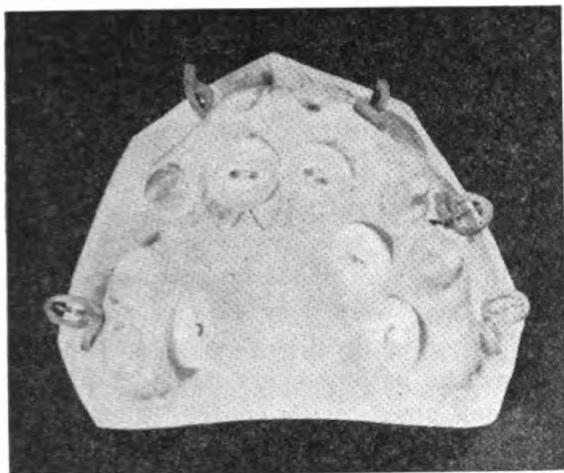


FIGURE 4. Occlusal view of upper model, showing how rubber bands were attached to the labial surfaces of maxilla by means of buttons attached to the palate.

passed forward. Precaution was taken to be sure that sufficient outward pressure was applied to keep the conductor between the periosteum and the inner surface of the ramus. If this procedure is followed the conductor will pass between the mandibular artery and nerve, thus protecting them from being severed when the saw is pulled back through the opening. The conductor was then pushed on forward until a protrusion was noted in the cheek at the lower border of the malar bone. A small horizontal incision

was made at this point and the point of the conductor was passed up through this opening. A piece of wire was then used to fasten the Gigli saw on to the conductor and the instrument pulled back, thus bringing the saw back through from the opening that had been made by the conductor. Handles were attached to the ends of the saw, and the ramus of the mandible was mechanically fractured. The same procedure was carried out on the opposite side, thus producing a bilateral fracture of the mandible. Fine silk was used to suture the four incisions with care taken to avoid facial scars.

The elastic bands from the buccal and labial surfaces of the maxilla were attached to the lower acrylic splint, thus retruding the mandible into a centric position that had previously been established, with the upper posterior teeth occluding in the indentations with the prepared acrylic splint.

*Postoperative care.* An ice collar was placed on the face for the next twelve hours and  $1/6$  grain of morphine given as a sedative. For the next few days swelling was of moderate degree and the patient rested comfortably. Hydrogen peroxide and saline mouth washes were used and sulfadiazine was continued in the dosage of 15 grains every four hours for two days after the operation.

Fluids were forced, and since the patient did not have any upper anterior teeth, sufficient space was present to allow cereals and soft creamy foods to be taken rather steadily.

Recuperation of the patient was uneventful. After the second week the rubber bands were changed as they had lost their elasticity. It was observed that the traction from the elastic bands held the upper teeth in the proper indentations in the lower acrylic splint, thus giving the fractured jaw a chance to heal in the proper centric relation that had been established. X-ray pictures showed that the mandible had been moved posteriorly about three-quarters of an inch. It was noted that the tongue had a smaller space to occupy and gave the illusion of being almost twice its original size.

After the fourth week the buttons were removed from the roof of the mouth and normal function of the mandible was observed. The acrylic splint was kept on the lower teeth in case any change took place in the patient's centric relation, as it would have been very easy at that point to connect the splint back up to the upper teeth in the event the fracture did not have proper union. Observing the patient every day for the next week it was noted that no changes took place in the centric relationship. All functional movements were the same as they were before the operation and no pain whatsoever developed in performing the various movements of the mandible. On the fifth week the splint was removed, the crowns of the patient's teeth polished down and hydrocolloid impressions were made for the construction of partial dentures.

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## MONOCULAR MICROFILM VIEWER

### THE ARMY MEDICAL LIBRARY MICROFILM SERVICE

The distribution of essential professional literature to Medical Department officers stationed all over the world has been a matter of serious concern to the Board for Review of Books and Periodicals appointed by The Surgeon General. Recently the list of books and journals authorized for distribution to medical installations was greatly augmented; provision now has been made to send periodicals direct to the commanding officer of each overseas installation through its APO address rather than through the usual distribution channels, in an effort to obviate some of the delays in delivery which have occurred in the past. However, even if the distribution of current medical books and journals were to function perfectly, from time to time there would be urgent need for information obtainable only in the stacks of an extensive medical library.

In recognition of this need the Army Medical Library has developed facilities and methods for reproducing on 35 mm. microfilm all forms of professional literature, from abstracts to complete journals, and even entire

books. Since microfilm can be sent by air mail, this development places the entire resources of the library within relatively easy reach of all medical officers. The service should prove invaluable as a means of supplementing current books and periodicals which are routinely distributed and as a means of providing access to the older medical literature which would be useful in connection with unusual medical problems.

Request for microfilmed material should include the complete reference, i.e., title, author, date, volume, and pages. When a medical officer has a justifiable need for a bibliography, he may call on the services of the Army Medical Library for this purpose. In such requests the subject to be covered should be clearly defined and should be particular rather than general.

The trained staff of the library is able to reproduce the desired material on microfilm and dispatch it by air mail within a very short time after receipt of requests for this service. However, it is essential to furnish the library with the complete address to which the microfilm is to be sent; in the case of an individual this should include the Army serial number. Requests for the microfilm service should be made to—

The Photoduplication Service, Army Medical Library,  
7th Street and Independence Avenue, SW.,  
Washington 25, D. C.

Microfilmed material may be projected on a white wall or screen by any suitable projector, or may be viewed through any of several types of viewers. The most convenient of these for general use under varied conditions is a small hand-type monocular microfilm viewer which will be available in the near future as a nonstandard item for distribution to overseas installations, on requisition through the usual channels. This instrument has been assigned Item Number 9N60700, with the following descriptive terminology:

Reader, Microfilm, Monocular, Hand Type, for 35-mm. Strip Film and 2" x 2" Slides: Handle to be equipped with holder for Army-type flashlight. Magnification to be 9X. Each, \$3.75.

This viewer will not be available for distribution to installations in the zone of the interior until overseas requirements have been met. However, individual medical officers in the zone of the interior as well as those overseas may purchase viewers through the Photoduplication Service of the Army Medical Library (price, \$3.75).

## THE PLASTER CART

The application of plaster casts and orthopedic dressings is facilitated in the hospital wards and operating rooms by the use of a special cart. Below are photographs and specifications of a useful plaster cart fabricated at O'Reilly General Hospital. They were submitted by Colonel George B. Foster, Jr., M.C., commanding officer.

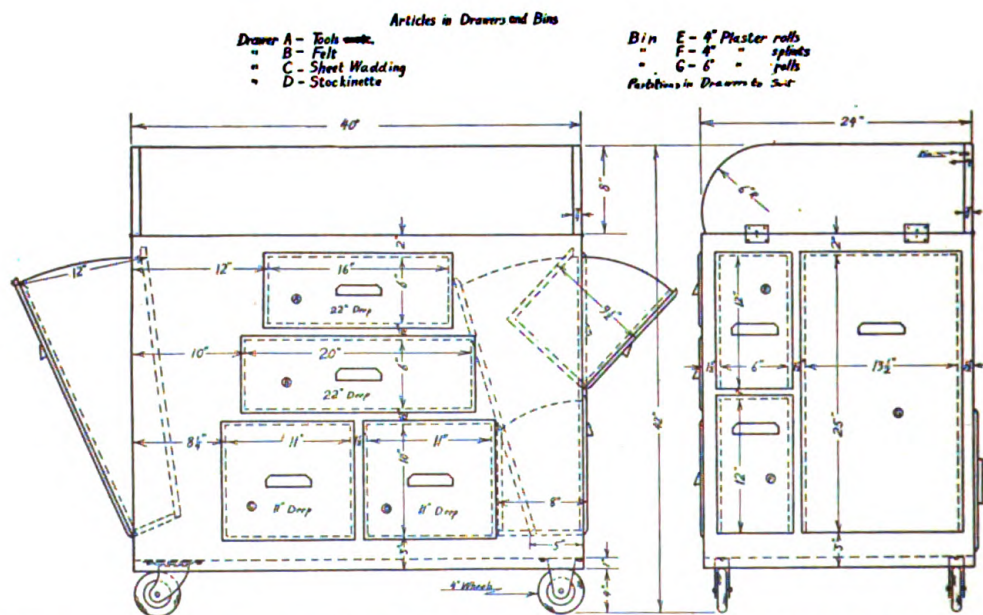
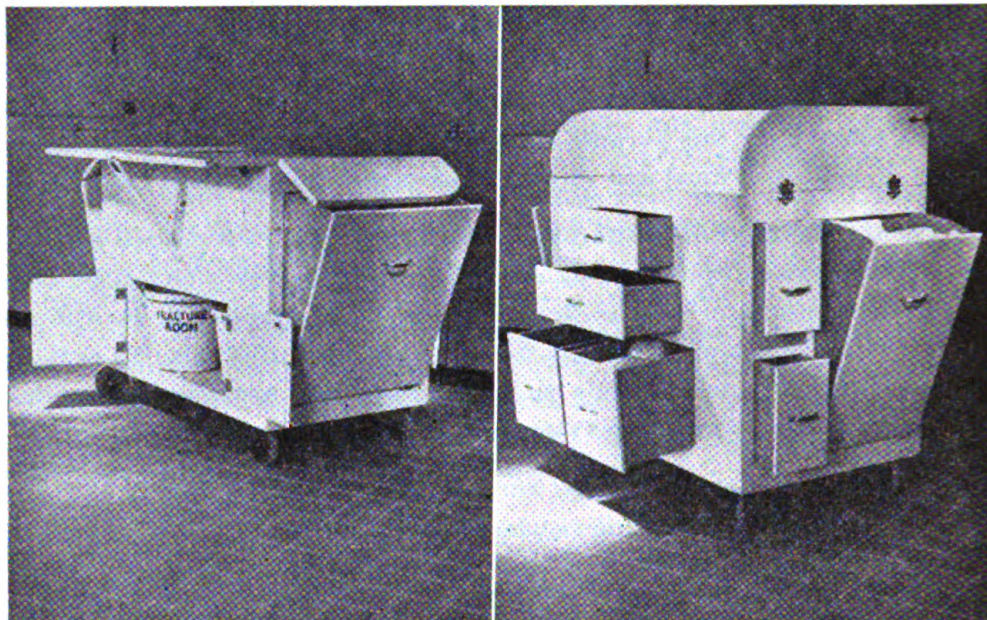
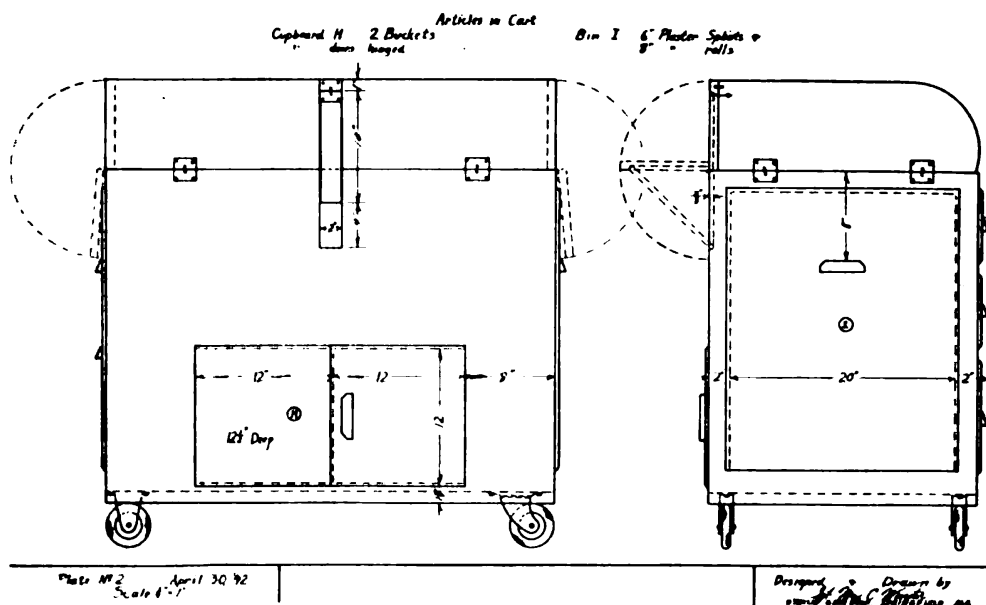


Plate No. 1 Date April 30, '92  
Scale 4"=1'

Plaster Cart

Designed & Drawn by  
H. C. Plummer  
ORIENTAL GEN. HOSP. SPRINGFIELD, MA.



## SULFADIAZINE CRYSTALS RETAINED IN KIDNEYS

MAJOR WILLIAM BROWN

Medical Corps, Army of the United States

Instances of hematuria, albuminuria, and the presence of casts in the urine during and following sulfadiazine therapy have been cited frequently in the literature. However, in most instances the urinary symptoms have promptly disappeared following the cessation of the drug in from a few days to two weeks. The case of our patient was observed who showed sulfadiazine crystals in urine four and one-third months after the drug had been stopped.

## Report of Case

The patient, a well-developed, strong, white, twenty-two year old paratrooper, was admitted to the station hospital at Fort Bragg on 3 March 1943 with the following symptoms: fever, leukocytosis, painful swollen knees, left elbow and left shoulder, gastro-intestinal bleeding, and a fine petechial purpuric rash. The diagnosis of meningococcemia was made and he was treated with sulfadiazine, receiving 57.5 gm. from 5 March 1943 to 12 March 1943. On 10 March his sulfadiazine blood level was 9.8 mg. per 100 cc. All acute symptoms had by this time subsided; he was afebrile and generally felt well.

On 12 March 1943, however, the urine which had up to this time been negative began to show increasing amounts of red blood cells, white blood cells, casts, and albumin. No sulfadiazine crystals were reported although they were carefully sought. All through March, April, and May, frequent urine examinations showed blood and albumin but no crystals. Activity on the part of the patient increased the pathological findings in the urine. Rest in bed caused improvement. Blood chemistries, numerous and frequent kidney function tests, blood pressure readings, Weil-Felix agglutination tests, heterophile agglutination tests, blood counts, and x-rays of the kidneys were all negative. There was no evidence of acute nephritis.



On 28 May 1943, he was transferred to the Stark General Hospital for further observation. Here the presence of red cells, white cells, casts, and albumin in the urine persisted. Again, it was noted that activity aggravated the urinary symptoms and that rest improved them. Physical examination and laboratory investigations were all negative. An intravenous pyelogram was negative. The patient appeared in good physical condition; he wanted to be up and about; he was tired of lying in bed. It was observed that the amount of bleeding was out of proportion to the amount of albumin in the urine. Thus, a urine "loaded with red cells" would show only one-plus or two-plus albumin.

During June 1943, the urine continued to show changes characterized chiefly by large numbers of red cells with relatively little albumin. In July, with the idea in mind that retained crystals of sulfadiazine in the kidneys might be the cause of his hematuria, large doses of alkalis were given. On 20 July 1943 the urine showed numerous sulfadiazine crystals and many red blood cells. From then on, there was rapid improvement; the bleeding stopped. For a while, the urine showed numerous white blood cells, but these gradually disappeared; there was no further albumin. He felt fine, gained weight, participated in the rehabilitation program for convalescent patients and was returned to duty on 13 August 1943.

#### Comment

The interesting feature about this case is the persistence of urinary bleeding for four and one-third months after the sulfadiazine was discontinued. No sulfadiazine crystals were found until four and one-third months had passed. Presumably, the crystals had been retained, either in the pelvis or the tubules of the kidneys, until they were dislodged and appeared in showers in the urine. Rapid improvement following their appearance in the urine seems to indicate that the sulfadiazine crystals were the cause of the urinary bleeding. It should be borne in mind that retained crystals of a sulfa drug in the kidney may be the cause of urinary symptoms many months after the drug has been stopped. The use of alkalis may be of some importance in preventing or improving this condition.

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**Prophylactic Psychiatry.**—The value of prophylactic psychiatry in raising the threshold of vulnerability to psychologic disorders cannot be overestimated. The psychologic stability of soldiers is directly proportional to their factual knowledge of the situations in which they will serve. For the average individual the ravages of disease and war are exaggerated. . . . Psychologic inoculation is the only effective preventive. Latent and imaginary dangers are naturally shocking on initial recognition, and attendant anxiety can be dispelled only when men are given an understanding of the irrationality and emptiness of most of their fears. A patient, simple, repeated presentation of facts will in most instances assuage doubts and "debunk" groundless anticipations.—Rome, Howard P. (Lt., M.C., U.S. N.R.), and Fogel, R. Harwood (Lt. Comdr., M.C., U.S.N.R.): *The Psychosomatic Manifestations of Filariasis*, J.A.M.A., 11 December 1943.

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